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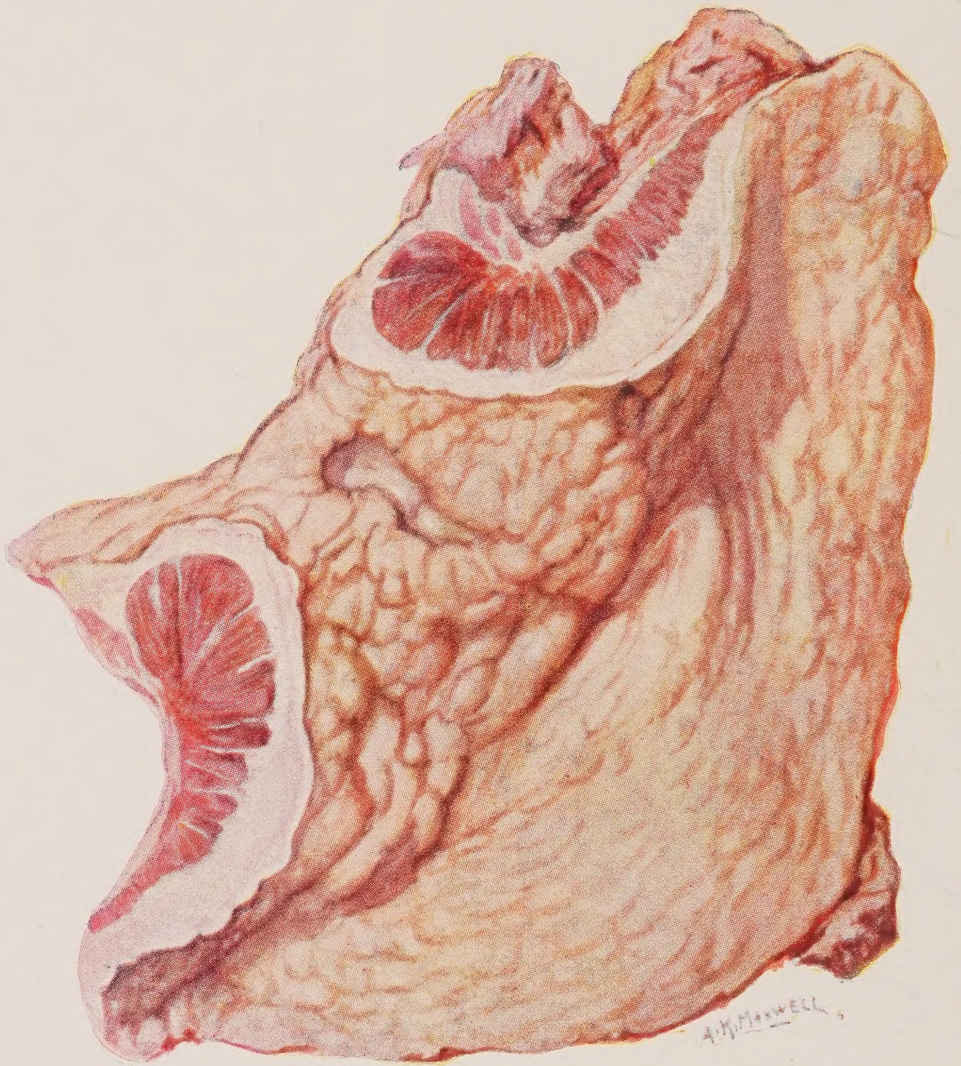
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See page 148

PRACTICE AND PROBLEM IN ABDOMINAL SURGERY

BY
A. ERNEST MAYLARD

B.S. (Lond.),
Surgeon to the Victoria Infirmary, Glasgow



WITH 39 ILLUSTRATIONS



LONDON
J. & A. CHURCHILL
7 GREAT MARLBOROUGH STREET
1913

PRACTICE AND PROBLEM

IN

ABDOMINAL SURGERY

BY

A. ERNEST MAYLARD

Author of the "Practical Abdominal Surgery"

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"If I have criticised, I hope it has not been with the smug infallibilism of ignorance, but with practical knowledge, tempered with the sympathy which is borne of experience."

W. BOYD CARPENTER.

PREFACE

IN the year 1880 I was for a few months Senior House Surgeon at Guy's Hospital. The position in those days was a responsible one. It involved the sole charge of all the surgical cases in the absence of the visiting surgeons. I merely mention this purely personal fact to indicate that the post brought me into intimate contact, for the time being, with all the surgical work carried on in the hospital.

These were the conditions which existed in one of the largest hospitals in London at that time. There were 275 surgical beds ; and the admissions for this particular year numbered 2892. There were four senior visiting surgeons and four assistant surgeons. There was one operating theatre, and two days a week for operating in it. But special operations were occasionally done elsewhere.

Now comes the interesting item, for comparison with which the above facts are given. Throughout the whole of the year, only twenty-three abdominal operations were performed. I exclude colotomies, of which there were five, because they were all lumbar, and did not involve freely opening the general peritoneal cavity. These twenty-three were made up as follows : two laparotomies for intestinal obstruction, both fatal ; three gastrotomies, all successful ; and eighteen ovariectomies, of which six were fatal.

There is no need to draw any comparisons between the work done then and that accomplished now, where each surgeon has his own operating-room and does sometimes three and four "abdominals" in a morning, such operations, too, as were never dreamt of in those days. But what excitement there was then ! How surgeons and students alike flocked to see the great operation : to see that sacred and almost forbidden cavity of the body opened : to see an operation in which the rate of mortality

was as high as 33 per cent. And now ? Well, there is no need to answer the question ; an appendicectomy, a colectomy, a partial gastrectomy, or any other abdominal -ectomy, excites as little interest as did an arthrectomy in the days gone by. And, if any comment upon our abdominal work is called forth in the present day, it is when we fail to record a percentage of mortality of less than five in most of our operations within the peritoneal cavity. The purport of these remarks and comparisons is to present some reasons, justifiable and excusable, I trust, for the production of the present work, and the many thoughts and opinions which will be found embodied in it.

It would be impossible for a man who took anything more than a passing interest in his subject to emerge from the dark and tentative period of 1880 into the brilliant light and accomplishments of the present day without having learnt something that he felt was valuable to himself, and that he might reasonably hope would be helpful to others.

It was in the year 1896 that I published a treatise on "The Surgery of the Alimentary Canal." It is quite out of date now, and of very little, if any, practical surgical value. But it possesses still one redeeming feature that may save it from utter oblivion, and give it a place among those works that medical historians occasionally find it profitable to consult. For one of my efforts, now nearly twenty years ago, was to show what had been accomplished in abdominal work on the Alimentary Canal up to the date of going to press. The "tables" showing these results were constructed at considerable expense of time and energy, for more work had been done in Germany, Austria, and elsewhere than in our own country. Indeed, that book was largely a compilation ; and my Reviewers, in crediting me for my researches, were kind and courteous enough to have expressed the wish that the purely personal equation might have found a more prominent place in the text. But neither experience nor boldness, in the limited practical knowledge I then possessed, encouraged me ; nor, I think, warranted me in saying much about myself or my work. But the nearly seventeen years which have elapsed since have emboldened me to do that which I neglected then ; and now I am only too conscious that

absorption and interest in practical work has so much engrossed me and occupied my time that where I previously excelled I have on the present occasion lamentably failed ; and not to give that due recognition to the labours of others, whose progress in the department of abdominal surgery so deservedly demands praise, is a dereliction of duty for which I can offer no other apology and excuse than that of enforced and not wilful neglect.

Let me, in conclusion, say in a few words what this book *is not* and *is* intended to be. It is no treatise on the subject of abdominal surgery. There is no systematic attempt to deal exhaustively with the various organs that are usually comprised in what is now understood by abdominal surgery. Many of the commoner operations are merely mentioned, without any description of their mode of execution.

The book is essentially the outcome of my own work : the practical experience of one who knew abdominal surgery at its inception : who has passed through its varied phases of development ; and who, at present, is enjoying that apparent apotheosis which it seems almost to have reached. An interest which, for thirty years, has never lacked in intensity and desire, has prompted me in addition to discuss some of the problems and practices which the subject embraces ; and if the giving expression to these be of any interest or help to those who, like myself, are more particularly devoted to this important branch of our profession, my venture will not prove altogether fruitless.

To my friend, Dr. Alexander Macphail, Lecturer on Anatomy at St. Bartholomew's Hospital, London, I am indebted for the anatomical drawings of the structure of the abdominal parietes from which Figs. 3 and 4 are taken. To Dr. A. F. Hertz, of Guy's Hospital, I am also obliged for the loan of blocks illustrating the normal shape and situation of the stomach ; and to Dr. John Anderson, Pathologist to the Victoria Infirmary, Glasgow, I owe a special debt of gratitude for the reports of post-mortem examinations and of specimens, without which many of the illustrative cases narrated would have been lacking in point, interest, and instructiveness.

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CHAPTER I

ABDOMINAL PAIN

MOST prominently there stands out in all abdominal work the symptomatic significance of pain ; and I feel, therefore, a few general and practical remarks on this particular symptom will not be out of place in a book which has for its exclusive consideration certain diseases of the viscera contained within the cavity of the abdomen.

To deal with pain in this region in any way exhaustively is quite out of the question. An attempt which I made in that direction some years ago took the form of a work entitled "Abdominal Pain." What I have to say now is based mostly on practical experience derived from personal observation ; and as the result, also, of endeavours to test the truth of some of the teaching culled from many sources which, at that time and in the manner indicated, I recorded.

The origin of pain, its nature of manifestation, and its mode of distribution are all attributes of great importance and engrossing interest. They are important because frequently possessed of certain and distinct diagnostic value ; and they are of interest because still presenting problems which theory, in the absence of fact, is as yet compelled to explain.

Origin of Pain. Speaking in a general way, it may be safely said that all acute inflammatory affections of the abdomen and its contents are associated with more or less pain. With growths it is not usually until they have excited an inflammatory process, or caused some definite functional disturbance such as obstruction to the normal passage of excreta that pain is felt. The really interesting question connected with the origin of pain, apart at present from all clinical considerations, is its direct or indirect dependence on the seat of the mischief in the particular organ or tissue involved. In other words, do the abdominal viscera

possess in themselves such specific nerve-endings that when unduly stimulated by disease they give rise to painful sensations attributable to no other cause than that in the implicated viscus itself? Or does such disease merely excite a reflex action which causes the pain to be felt only at such places on the body surface where there are known nerve-endings capable of manifesting the true sensation of pain?—that is to say, is the pain produced by a diseased organ always a “referred” pain? Those who hold exclusively to the latter view have, I venture to think, the more difficult position to maintain. That “referred” pains do occur none would or indeed could deny; but that they are the exclusive manifestations of this particular symptom I for one have considerable difficulty in accepting. If, for instance, one squeezes a movable kidney, presses upon an ovary, or pinches a testicle, a type of pain is produced quite characteristic in its features, and totally distinct from the pain which arises as the result of a stimulus applied to the associated sensory nerve-endings in the skin. Again, an inflamed appendix may produce a “referred” pain in the region of the umbilicus; but pressure exercised upon it directly through the iliac parietes will cause pain in the region of the organ itself, and this quite apart from any possible involvement of the sensitive parietal peritoneum. It is quite probable that the abdominal viscera fail to respond to tactile impressions or to the stimuli of heat and cold; but these are questions rather of physiological interest than of clinical importance.

The peritoneum when inflamed is an evident source of pain; but there are many marked degrees of sensitiveness in the membrane. Every surgeon has noticed, when operating without an anæsthetic or under incomplete anæsthesia, that manipulation of the parietal peritoneum, or putting tension on the mesentery, at once causes pain, and that no such result ensues when handling the visceral layer. Perhaps the most striking illustration of the sensitiveness of the mesenteric nerves to pain-producing stimuli is observed in cutting the meso-colon when removing a loop of large intestine, which has been previously transfixed outside the abdomen for some special reason. The operation is frequently done without the use of an anæsthetic,

so that the patient's own feelings are capable of giving very certain evidence of the suffering endured. While the bowel is being divided very little discomfort is experienced, but immediately the meso-colon is severed and any ligatures are applied acute pain is felt.

Nature of Manifestation. Pain, as exhibited in abdominal disease, is probably as extreme and diverse in its manifestations as that met with in any other region of the body. In its acutest form and in its prostrating effects no pain exceeds in suddenness and severity that which follows a perforation of a hollow viscus. On the other hand, in the initial stages of growth, ulcerations, cholelithiasis, and many other affections, the pain is of such a slight character that discomfort rather than pain would seem the more correct expression to employ. Perhaps the most characteristic pains met with in the abdomen are those described as colicky. They are invariably, if not exclusively, due to the exaggerated efforts of muscle-walled canals and cavities to rid themselves of some foreign, irritating materials. Another characteristic of abdominal pain, although not so exclusively peculiar to the region as that just described, is its capability of being distributed to a part remote from the actual seat of disease. This pain, already briefly alluded to, is then known as "reflex" or "referred." A striking and familiar example is that of pain in the epigastric or umbilical region in the initial stages of acute appendicitis. Another equally good illustration is the presence of stone in the kidney, producing pain in the testicle. The reason for these "referred" pains will be explained immediately, but their clinical significance is appropriately emphasised here. Without due appreciation of the multiple interpretations of which these "referred" pains are sometimes capable, many mistakes are liable to be made both in diagnosis and treatment. Thus, how often has the stomach been treated for pains in the epigastrium which have had their origin in affections of other abdominal viscera. The only safe and certain way of properly appreciating the clinical value of a "referred" pain is not to accept it as the sole suggestive symptom, but only to deem it of corroborative significance when other associated conditions point to the same focus of disease. It would then be impossible to ascribe an epigastric pain to

a gastric derangement when no other evidences existed suggestive of disease of the stomach.

Mode of Distribution. It is of no little interest to inquire into the physiological explanation of pains which have their

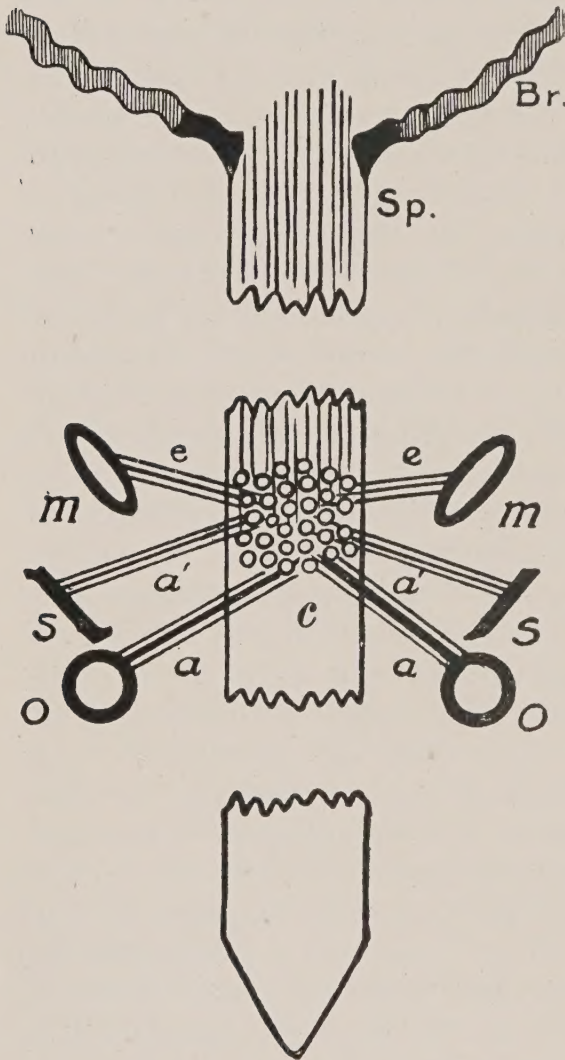


FIG. 1. Diagrammatic scheme of "referred" pain. Br., Brain; Sp., spinal cord; *m*, muscle; *s*, skin; *o*, organ; *c*, nerve-cells in spinal cord; *a* and *a'*, afferent nerve-fibres; *e*, efferent nerve-fibres.

seat at some distance from the focus of disease, and for this cogent reason among others, that it helps us to understand why these pains should vary so much in their acuteness of manifestation and so strikingly in their breadth of distribution. I cannot, perhaps, better illustrate the mode of distribution of pain than by presenting a diagrammatic drawing of the various nerve-connections which associate the diseased organ with the sensory nerves. By referring to this diagram it will be seen that fibres, *a*, pass from the organ, *o*, to cells, *c*, in the spinal cord. But these cells are in close proximity to other cells which have fibres, *a'*, coming to them from the skin, *s*, and fibres going from them to the muscle, *m*; in addition there are fibres passing upwards from these cells to the brain,

Br. When, then, an abnormal or exaggerated stimulus arises in the organ, it excites a similarly abnormal or exaggerated stimulus in the cells in the cord. This effects a triple result. First, it conveys an impression to the cells by means of

the afferent nerves that a stimulus has been applied to the sensory nerve-endings in the skin ; secondly, it causes an impulse to be sent along the efferent fibres to the muscles, resulting in their contraction ; and thirdly, it makes the brain cognisant of the disturbance in these cells. To express these facts in clinical language, pain is felt as if seated on the surface of the body at those particular spots from whence pass the nerves to the hyper-irritated spinal cells. It thus becomes very much an anatomical question to know the exact distribution of the nerves which go to and from particular centres in the cord, and a physiological one to understand the variations of degree and distribution of the pains felt as the result of an abnormal stimulus. The three principal determining factors in the amount of pain felt and in the wideness of its distribution are, first, the potency of the stimulus in the affected organ ; secondly, the relative irritability of the cells in the spinal cord ; and, thirdly, the susceptibility of the cerebral centres. There is no difficulty in understanding how the first of these factors plays its part ; for it stands to reason that the more severe the lesion in the primary source of the pain, the greater is likely to be the manifestation of the latter. In the case, however, of the second and third factors, the extent of the irritability and sensitiveness to the reception of influences may be very largely affected by other and extraneous agencies. Whatever we may understand by constitutional disturbances, it is these that chiefly affect the nerve-centres and render them more susceptible to stimuli. Thus, patients suffering from anæmia and other abnormal blood conditions will often complain of pain more acutely felt and more extensively distributed than those whose blood is healthy. The physiological explanation of this seems to be that not only are the cells in the cord which are directly associated with the parts immediately concerned more irritable, but that those in their proximity and those also more remotely situated are similarly affected, and the impulses received by the one set overreaches or extends to their neighbours. The impression then received by the brain is that a much wider field is involved, that pains are felt augmented and at parts not strictly limited to the usual area of "referred" pain. As a clinical illustration of these anatomical and

physiological considerations may be instanced the pain arising from gastric ulcer or gall-stones. The "referred" pain at first is frequently limited to an area in the epigastrium and right hypochondrium; that is to say, at the peripheral extremity of those sensory nerves whose afferent fibres enter the same group of cells in the spinal cord to which afferent fibres pass from the stomach and gall-bladder. But the pain may become much more widely distributed and be felt in the side, back, shoulder, and even in parts more distant. We must, then, conclude that cells other than those just indicated have been irritated to account for these more diffusely located symptoms.

The part played by a blood condition, such as anæmia, in increasing the irritability of the spinal cells is possibly best illustrated in cases of affections of the female reproductive organs, where any cause producing increased excitability of these viscera is liable to produce not only the strictly limited "referred" pain in the right or left lower iliac and sacral regions, but distributed pains in more distant parts of the body. Too frequently these remote and irregularly located pains are described as hysterical or neurotic when, as a matter of fact, they are true indications of functional or organic disturbances in the uterus, ovaries, or Fallopian tubes.

There is little doubt that, purely through blood stimulation in the cells in the cord, pains may be evoked which have no origin in any peripheral lesion. These pains may be of a migratory character, but when at all persistent are liable to lead to mistakes in diagnosis. They can only be properly appreciated and given their due significance by finding that there are no other associated symptoms to support the condition they are apt to erroneously suggest. Into this category may possibly fall some of those mysterious cases where an exploratory laparotomy has failed to detect a cause, and yet apparently has resulted in a cure, for the pains disappear.

Yet another source of misleading abdominal pain must be referred to because somewhat similar in its origin to that just described. Actual lesions of the cord—usually of an inflammatory nature—may produce "referred" pains which may be so persistent and severe as to deceive all but the most careful. I have known the stomach

explored because of the excruciating epigastric pains experienced in *tabes dorsalis*, and children treated for supposed gastric affections when their epigastric pains have arisen from caries of the spine in the mid-dorsal region. It need hardly be pointed out that such mistakes can never arise if due regard be given to the fact that pain alone should not constitute the sole symptom upon which a diagnosis is made. The existence of pain only helps to corroborate what other symptoms more clearly and exactly indicate.

The abdomen also is not exempt from pains referred from parts entirely without the region itself. I must own myself to the mistake of having been once misled in a case of commencing pneumonia. The child, for such was the patient, was seized with acute abdominal pain and tenderness to pressure on the parietes. The tongue was brown and dry, the temperature high, the pulse rapid, and the appearance of the child as if toxic. The condition was considered by the doctor in attendance as one probably of acute general peritonitis dependent upon some grave visceral lesion. When I saw the child the symptoms above described were marked, and I did not, after a somewhat hurried examination, hesitate to support the opinion expressed. The child was removed at once to hospital, and the abdomen opened. The exploration was entirely negative. The child's symptoms remained much the same, and it died within forty-eight hours. We were, fortunately, able to obtain a post-mortem, and the lesion revealed was that of a double pneumonia. A subsequent careful inquiry into the history of the child's illness elicited from the mother the striking and instructive fact that before it had complained of pain in the abdomen it had had a pain in its side. Had, following upon the story of such an initial symptom, an examination of the chest been made, grave respiratory trouble would doubtlessly have been detected, and an error in diagnosis and treatment avoided. It only needs one such mistake to be placed for ever after on one's guard.

Certain affections of the heart may cause epigastric pain; but the symptoms of cardiac disease will be so manifest in other directions that it is unlikely that the abdominal pain itself will mislead.

When we come to consider pain in its essentially practical and clinical aspect, we must view it from two primary standpoints. First, as manifested by the patient ; and second, as elicited by the surgeon. When both exist and agree much help is obtained ; but when the first only is present and cannot be supported by the second, then arises the difficulty.

Pain as complained of by the Patient. It is often difficult for the patient to express himself in terms such as we should like. However, it is always possible for him to locate the seat of the pain—where it first commences and where it is most acutely felt. For diagnostic purposes the actual seat of commencement is of more importance than the acuteness of the sensation. That it should be so will be easily understood when reference is made to the explanation given above of “referred” pains. What we want to know is the organ in which the lesion is situated that calls forth the “referred” pain ; and this will be best determined by knowing the spot which first indicates the irritation of those cells in the cord to which the afferent sensory fibres proceed from the body surface. In cholelithiasis, for instance, the patient may complain of pain in the shoulder, but it is of much more diagnostic value to know that the pain was first felt in the right hypochondrium, because that is the truly typical seat of “referred” pains in gall-stone disease.

It would occupy much too much space to attempt to describe the various seats of “referred” pain in affections of the different abdominal viscera. I shall, therefore, content myself by merely giving a diagrammatic representation of these localities ; and leave the reader, by the aid of the descriptive note at the foot of the illustration, to ascertain them for himself.

As regards the character of the pain manifested, the greatest possible difference exists in patients. Naturally it must be so, because functions are just as varied in their manifestations as are the structural differences in every individual. What is acute pain with one would only be subacute in another ; mere degree can, therefore, never be of any great diagnostic significance except when it is accompanied with other manifestations which render it clearer. There is no mistaking the acuteness of pain that

is accompanied with shock and severe prostration ; and I do not think I exceed the limits, at least of surgical

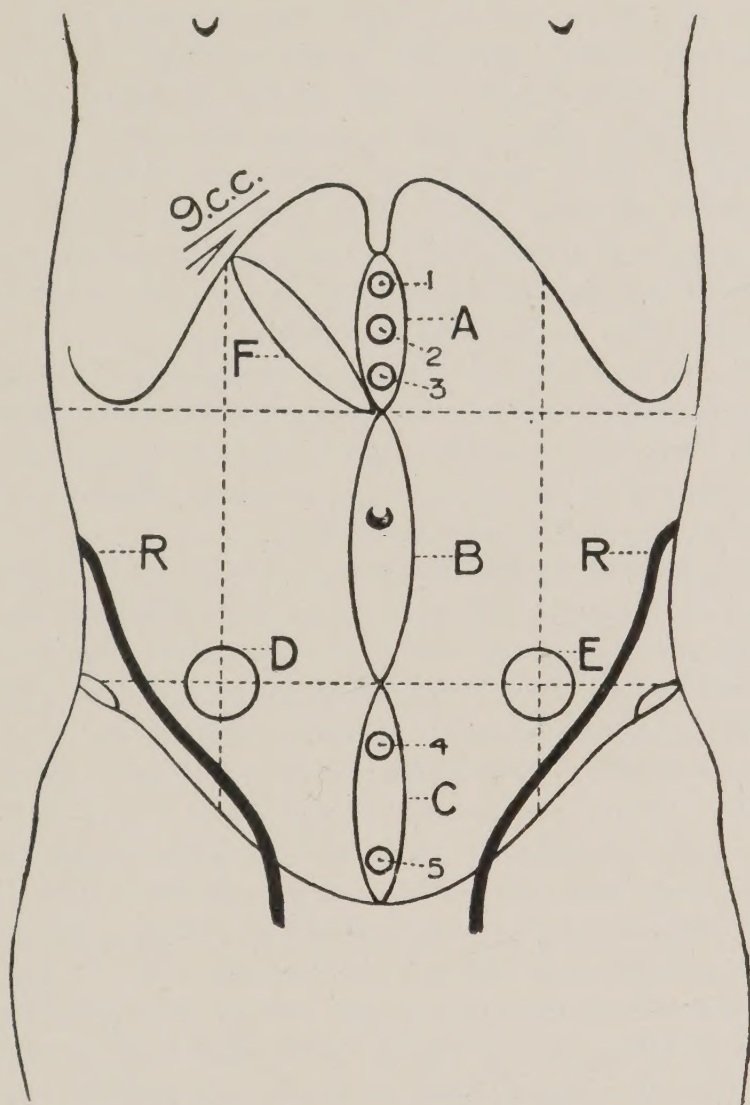


FIG. 2. Diagrammatic representation of seats of maximum "referred" pain in diseases of the abdominal viscera. A, Stomach and pancreas ; B, small intestine and vermiform appendix ; C, large intestine, rectum, uterus, and bladder ; D, vermiform appendix, right ovary, and Fallopian tube ; E, vermiform appendix, both ovaries and tubes ; F, gall-bladder, cystic and common ducts, and duodenum ; R, kidneys and ureters. 1, Gastric ulcer towards cardiac end of stomach ; 2, ulcer midway between cardiac and pyloric ends ; 3, ulcer at pyloric end ; 4, large intestine down to splenic flexure ; 5, large intestine from splenic flexure to anus. (Modified after Mackenzie.)

advice, when I say that such a pain with such concomitants should be regarded as requiring in the great majority

of instances early operative interference. To attempt to alleviate such pains by the administration of morphia without every regard to their true cause is only to temporarily ease suffering at the future expense of life.

When a patient complains of intermittent attacks of griping pains, often following at variable periods the ingestion of food, it may generally be taken to indicate obstruction of some kind. Whether they are due to gall-stones or to a stricture in the course of the gastro-intestinal canal, will be determined by the particular locality of the pains and other associated symptoms.

There are many kinds of pain complained of by patients, such as burning, boring, shooting, stabbing, dragging, cutting, &c., but none can be said to have any specific significance, occurring, as they may, in more than one kind of disease and in different situations.

Pain as elicited by the Surgeon. When it is possible to evoke pain, much light is generally thrown upon the probable nature of the complaint and the particular part from which it arises. In eliciting pain, however, by means of digital or mechanical stimuli, distinction has to be drawn between superficial tenderness and deep pain. When by surface mechanical stimulation the skin is hyperæsthetic or hyperalgesic, it may be taken for granted that it is a "referred" sensation, and indicates that the seat of the disease is in some possibly remote organ whose afferent nerve-fibres when reaching the cells in the spinal cord are in close association with those which receive their afferent sensory nerve-fibres from the tender skin area. To render the examination as exact as need be, and therefore as diagnostically helpful as possible, every effort should be made to ascertain the maximum point of hyperæsthesia. Head's well-known investigations into the segmental distribution of cutaneous areas of hyperalgesia have not in my experience proved of much clinical value, however true as physiological facts. I have tried to prove their truth, but either the areas of cutaneous tenderness with their maximum points could not be accurately mapped out or, if an approach to accuracy was attained, their value for diagnostic purposes were not correspondingly supported. For purely practical reasons, therefore, I have given up attempting to utilise these particular methods in diagnosis.

No sign elicited by the surgeon is of such diagnostic importance as that gained by the definite evidence of pain evoked by deep pressure. But to possess its full value the investigation must be carried out skilfully. If, as most frequently happens in all cases of painful lesions, there is deep-seated inflammation, to apply the hand or fingers cold, or to exercise sudden and rough pressure, is to call forth a powerful contraction of the abdominal muscles. The rigidity which results not only prevents further pressure being made, but conveys the impression of a much more widely diffused area of pain ; thus, any localisation is rendered impossible. To obtain, therefore, the end required, the warm palm or surface of the hand, and, better sometimes, the balls of the first, second, and third fingers, should be placed gently upon the parietes. If the pressure thus applied be not sufficient, augmented power can be obtained by placing the fingers of the non-examining hand upon the dorsal surfaces of either one or more of the other. In this way it is possible to detect a pain-producing lesion in almost any part of the abdominal cavity. The clinical significance of pain so evoked is that it renders practically certain the existence of mischief at the particular spot where the pressure produces the pain.

As I remarked in the opening sentences of this chapter, the discussion of the subject of abdominal pain would have to be necessarily brief ; but any who would wish to pursue the subject more extensively cannot do better than read the excellent papers published by James Mackenzie in *Brain* (vol. x, Part III, 1893, p. 324) and the *British Medical Journal* (vol. i, 1906, pp. 1449, 1523), and the equally instructive contributions by Henry Head in *Brain* (vol. xvi, 1893, Part I). In my own work also, "Abdominal Pain," will be found references to numerous other workers on the subject.

CHAPTER II

**DIFFICULTIES IN DIAGNOSIS AND PROBLEMS IN
PROGNOSIS. EXPLORATORY OPERATIONS**

Difficulties in Diagnosis. It was an old chief of mine, the late Mr. Cooper Forster, ex-President of the Royal College of Surgeons and Senior Surgeon to Guy's Hospital, who used to say that "the abdomen was the Temple of Surprise." It is true that in his time abdominal work occupied only a very limited sphere in the domain of surgical practice. But notwithstanding the enormous advance that has taken place within the last twenty-five years, it must still be owned that we are far from being able to acknowledge that that metaphorical simile has no truth in the work of to-day. If it were not for the fear of casting too adverse a reflection on my own diagnostic acumen, I should almost be tempted to say, as sometimes indeed I have said, that we more frequently open the abdomen and find what we do not expect than what our previous investigations have led us to anticipate. Perhaps I am expressing myself a little too pessimistically ; but I cannot help feeling that if we honestly examine and confess our experiences, it would be, at least, to acknowledge that we very frequently do open the abdomen and fail to find exactly that which we expected. So long as human nature is what it is, and we have no reason to believe it ever will be any different, we can never suppose that practically the same lesion in two individuals will manifest symptoms equally similar in both. Disease considered anatomically and physiologically is merely the aberrant exhibition of normal structural and functional changes ; and must, therefore, in its symptoms differ as widely in two individuals as do the natural external characteristics which cause the one in life to be distinguished from the other. Is it any wonder, therefore, that as experience grows, our increased knowledge leads us less and less towards generalisation, and that so-called classical symptoms become fewer the more we consider individualities. Thus, then, it is seen that there

are difficulties in diagnosis dependent on essentially natural causes; and therefore these attributes are such as can never be eliminated from all questions affecting the varied manifestations of disease.

There is another difficulty which is similarly dependent to a certain extent on normal anatomical and physiological conditions. It is that different diseases may produce like symptoms. This is best illustrated in the symptom of "referred" pain. For instance, pain in the epigastric or umbilical region may have varied seats of origin, and the differentiation of these seats can only be effected by a careful investigation into the coexistence of other symptoms. The explanation is perfectly clear when we remember that the great solar plexus, into which pass so many sympathetic fibres from the viscera of the abdomen, is in direct association, through correlated nerve-cells in the cord, with the sensory nerve-fibres which proceed from the epigastric and umbilical regions.

A difficulty, which I have never seen expressed and yet one which all must have experienced, is that arising out of the temporary improvement which patients suffering from some organic lesion occasionally undergo in the earlier stages of disease. Let me illustrate what I mean by reference to a class of cases in which this particular difficulty is specially prone to occur. Disease of the stomach frequently manifests itself in a very insidious and deceptive way; and under the all-embracing term of dyspepsia symptoms are complained of varying both in degree and duration. Now a patient thus suffering when brought under the strict *régime* of a private nursing home or a public hospital soon begins to find that the simplicity and regularity of his diet, the rest and release from all home anxieties, the skilled attention constantly administered—that all these changes in his ordinary mode of living are having a very beneficial effect. His appetite improves, he puts on weight, and he feels in every way better; and both he and his doctor are hopeful that a cure is going to be effected. With this hope in view the patient leaves the institution. He has not, however, long returned to his usual mode of life before the symptoms again begin to trouble him, and these very often in an exaggerated degree. The truth is then revealed, and it is fortunate if a stage

has not been reached when really effective and proper treatment can be employed. I well remember a case which occurred in my practice some years ago typically illustrative of the picture just painted. It was that of a young man admitted to my ward suffering from obstinate dyspeptic symptoms. He so much improved while in hospital that I sent him out with the advice to return if there was any recrudescence of his trouble. He did so in about six months' time, and so much worse that there was no mistaking the gravity of his condition. I operated and found such advanced carcinoma that extirpation was out of the question. In reviewing his case in the light of what was subsequently revealed, I believe when first he entered my ward he had a gastric ulcer, and that at that time it might have been successfully removed. The kind of difficulty which I have just been describing can only be effectively met and overcome by not considering that a case is being properly treated unless its cause can be fairly understood. Naturally, however, herein lies the greatest difficulty; but if it be constantly borne in mind that grave disease of the stomach is nearly always preceded by dyspepsia in one or more of its varied forms, then the somewhat prevalent practice of too lightly regarding gastric derangements in their initial stages and subjecting them to prolonged courses of purely sedative treatment, will give place to more careful investigation and the employment of specific tests, which will probably throw a clearer and more correct light upon the true nature of the complaint.

There is the greatest possible difference in the ease with which some abdomens can be palpated. Some are so flaccid that no difficulty is encountered in examining the deeper structures, while others seem to forbid little more than the most superficial examination. I exclude such a physical obstacle as obesity, because a cause of this nature must necessarily render deep palpation difficult, however lax the tissues. But the particular state of the parietes to which I wish to draw attention is that of rigidity. Now this condition may prove either a help or a hindrance to diagnosis. It becomes a help when in addition to the rigidity palpation causes pain in proportion to the amount of pressure exercised. The significance of the rigidity then

becomes clear. It means that the abdominal muscles have been put into a state of protective contraction. Just as the muscles acting upon an inflamed joint will secure that joint against mobility, so do the abdominal muscles by their contraction guard the injured parts beneath them against any undue disturbance from external agencies. We know, therefore, when the parietes are rigid and digital pressure causes pain that there is a lesion—generally inflammatory in character—beneath the area involved in the process of examination. But there is another kind of rigidity not infrequently encountered which is a considerable hindrance to diagnosis, and which creates a difficulty it is not easy to explain. We may do what we will—make the patient flex the thighs upon the abdomen, raise the chest, ask for easy respiration, and plead for relaxation, yet by no means can we obtain the needed relief of tension. It is certainly an involuntary reflex in many cases, and in some is unquestionably due to a reflex stimulation of the motor-cells in the spinal cord. In the latter class it should have diagnostic significance if there are other symptoms present in support. It is then probably explained by the fact that the cells in the cord, from which pass the efferent motor-fibres to the muscles, are excited by those afferent fibres which come from some deep-seated disease. Inasmuch as no pain is felt, we must conclude that the cells associated with the sensory nerves are not excited. This explanation will be better understood by a reference to the diagram of “referred” pain (*see Fig. 1, p. 4*). In further support of the involuntary character of this kind of contraction is the frequent difficulty encountered by the Anæsthetist in obtaining a laxity of the parietes sufficient for the easy performance of intra-abdominal operations. It is sometimes the result of a reflex stimulus derived from a deeply seated focus of irritation; but there are times when no such possible exciting lesion is discovered to account for the rigidity, and one is just as much at a loss to explain its persistency as when it exists under ordinary conditions of physical examination. It is a state almost exclusively met with in men, and those too of the spare muscular type; so that possibly mere anatomical development of the abdominal muscles may have something to do with it. But whatever may be the cause, it

certainly renders diagnosis by palpation, without the aid of an anæsthetic, a very difficult and often impossible measure.

Problems in Prognosis. When diagnosis is difficult and doubtful, prognosis must be impossible; therefore, it follows that to be sure in prognosis we must be certain in diagnosis. But this does not exactly convey the truth, because to be perfectly correct in our forecast we must know something more than the exact nature of the disease as it exists at the time of our observation; we must know the course it will pursue. Herein, however, lies one of the most difficult problems with which we are beset. I have no intention in this connection of dealing with special diseases except in so far as they illustrate particular points which I wish to introduce; my object is solely with more general problems. In illustration of what I mean let me give the following as an instance. The abdomen has been opened in order to treat some obvious organic lesion, the exact nature of which we had had no previous means of knowing. We find that which we consider is carcinoma of some viscus; and, further, that it is either inoperable, capable of being only palliatively dealt with, or, if removal be attempted, complete extirpation is but doubtful. Now comes the problem. How are we to discuss the matter with, or make known the situation to, our patient? The state of affairs before operation may have been, quite probably, that our patient was blissfully ignorant of anything very serious in his condition. He may possibly have been able to attend to his business, and more or less enjoy life. Nature, as yet, had given him no indication that his days were probably numbered; and because we have looked into his abdomen and discovered what we believe to be his death-warrant, have we any right to usurp the position of Nature and indicate what she has not yet deemed it necessary or right to make known? I must confess myself entirely opposed to any such premonitory enlightenment; and for three very cogent reasons. First, that which may be considered a purely moral reason, that we have no right to pass the "Sentence of Death" when Nature has not yet herself deemed it expedient to make known her verdict. In connection with this reason, and as a good illustration of its force, there comes to my mind the case of an old gentleman, particularly bright and active, who had, as

far as one could judge, unmistakable advanced carcinoma of his pylorus. I performed gastro-jejunostomy. He did excellently, thoroughly enjoying his food, smoking to his heart's content, and taking a very lively interest in politics. Suddenly he was struck down with an apoplexy. Nature had spared him any knowledge of his cancerous condition ; and what right had I to have perhaps made his short life miserable by telling him of my discovery. Secondly, that we have not yet reached that stage of diagnostic accuracy which admits of our being absolutely certain that that which we have discovered by our operative investigation is really that which we at the time consider it to be. I have only to appeal to the experience of any abdominal surgeon to receive support of the truth of this statement. How often do we see recorded in the medical journals cases of the mysterious disappearance of lesions within the abdomen which when observed and examined at the time of the operation were considered unmistakably malignant ? Nay, more than this. The microscope has been known to confirm macroscopical appearances, and yet disappearance has ensued. There should be something profoundly encouraging to us in these facts, enabling us never to withhold hope from our patients. We can always qualify our worst fears with expressions of encouragement ; and life with most is so precious that the last straw will be tenaciously clung to until it breaks. A lady called one day at my house, bringing with her her daughter, who was suffering from some gastric condition. I did not recognise her. After some few remarks she observed : " I have to thank you for saving my life." I was somewhat taken aback, when she further added : " It is between nine and ten years ago that you performed an operation upon my stomach. I have been a different woman ever since, taking my food well and able to attend to my household duties." I then looked up my report of her case taken at the time, and this is what I found : " Examination of the abdomen revealed a freely movable tumour in the region of the umbilicus. The abdomen was opened and a mass found involving the pylorus evidently cancerous in nature. It was fixed in places, and on account also of the existence of several enlarged glands removal did not appear possible. The 'no-loop' operation of posterior gastro-jejunostomy was performed."

But hope of cure introduces the third reason why we should withhold from indicating what at the time may seem to us likely to portend a fatal issue. The influence of the mind upon the body has ever been known to exercise a power that may be either baneful or beneficial to the various functions of the organism. In the pre-anæsthetic days, the fear of an operation has been known to kill a patient before even its execution had commenced. The sight of blood will make many a patient faint, and the fear of pain cause the most exaggerated excitement. The beneficial influence of a hopeful and believing frame of mind is the very essence of "faith-healing," and a most powerful factor in our own profession in the successful treatment of many purely functional disorders. But all this is too well known to be worth repeating, even to the extent of further stating that much has been written on the successful reaction seen in organic lesions by a concentrated mental effort. To return, however, to what we are more immediately concerned with, the practice of surgery. Two very striking cases, coming under my own personal experience, present themselves very vividly before me. One was that of a lady in a distant country district whom I was asked to operate upon for advanced ovarian cystoma. On opening the abdomen I found extirpation impossible, for the growth was malignant and had already so invaded the anterior parietes and other neighbouring parts that I could do no more than close the abdomen without making any attempt to detach the tumour from any of its connections. Before leaving the house, the patient had sufficiently recovered from the anæsthetic to be sensible enough to ask, very pointedly and intelligently, the result of my efforts. I had to tell the truth. She closed her eyes, and from that moment onwards made no effort to rouse herself or take food. I heard subsequently that she died quietly the next day with no symptoms other than those which might be regarded as indicative of fatal resignation. The other case presents an aspect the exact opposite of that just described. I had performed cæcostomy some days previously for intestinal obstruction, the cause of which at the time was unascertainable; but the subsequent actions of the bowels per anum ed us to believe that it had passed away. The discharge of fæces from the cæcum on to the body surface

had a most depressing effect upon the patient ; the wound was flabby in appearance and, in general, wanting in tone. I managed by expressions of encouragement to win the patient's confidence and get her to accept my assurances that she would completely recover. On visiting her the next morning I saw quite a changed aspect in her countenance. She had had a good night, and was quite bright and cheerful. On looking at the wound the change in it was as remarkable as her general appearance—so remarkable, indeed, as to be observable to all those who saw it. It presented a typically healthy granulating surface with an amount of tone about it that augured well for rapid occlusion of the fistula. So forcibly impressed upon my mind has been this case that I have often alluded to it and utilised it for the same purpose that I do now, to indicate how marked upon the effect of the healing of a wound is the condition of the patient's nervous system. It must be owned, therefore, that if we want—and it certainly is the paramount wish of every operator—to get our wounds to heal rapidly and by primary union, it behoves us to do all we possibly can to reassure and encourage our patients both before and after operation. If we know that our operation is really a very serious one, I do not think, from our strictly surgical standpoint, we are justified in warning our patient of its gravity. Our patient places himself unreservedly in our hands to do our best for him, and we fail in our duty if we interpose any considerations that are likely to mar the success of our efforts.

There is an interesting series of problems associated with various intra-abdominal operations which are directly connected with questions of prognosis. Some are of almost vital importance ; others, in view of the operations being expedient rather than of absolute necessity, merely of interest. For instance, have the appendix and gall-bladder functions to play in the human economy which renders their retention considerations of some importance ? Or are they accessories of such a simple nature that their removal is immaterial ? It seems impossible to conceive that Nature has universally introduced into any part of her work that which is to be useless. On that reasoning alone, therefore, I should say we ought neither to remove the appendix or the gall-bladder ; our only cause for doing

so should be their evident failure from disease to perform whatever functions they may possess.

It is no uncommon question to be asked, what is the ultimate effect upon life of, say, short-circuiting the stomach with the small intestine for chronic, gastric, or duodenal ulcer; or of excision of the colon for chronic constipation? Both affections are in themselves not necessarily incapable of relief or even of cure by other means than by surgical intervention. Each operation must have most disturbing physiological effects both in their immediate and remote results. If we think of the beautiful physiological mechanism which exists between the opening and closing of the pyloric aperture; how, as soon as the contents of the stomach are fit for their normal ejection or propulsion into the bowel, the pylorus opens and allows them to pass, and then closes again so soon as the duodenum has received all it can efficiently dispose of; how, also, the pouring of the bile into the second part of the duodenum is probably influenced by the acid contents of the bowel;—when, I say, we reflect on all these intricate and well-arranged processes, we are lost in perplexity to understand how, after such an operation as gastro-jejunostomy where no guiding and guarding influences exist for the passage of the stomach contents through the artificial opening, the natural processes of digestion can be carried on without the production of some subsequent deleterious results. That Nature does mysteriously make some certain, compensatory arrangements the immediate success of our operation sufficiently testifies; and the problem, difficult as it may at first appear, is partly solved for us by the normal life which for years patients so treated may live. But the solution to be really complete involves a prognosis of the total length of life likely to be lived by patients who have undergone the operation of gastro-jejunostomy for such a condition, for instance, as simple cicatricial pyloric obstruction. Can it possibly have a shortening of the period of existence? The operation was first performed by Wölfler in 1881; so that it ought to be possible to ascertain whether there are patients living at a period at least twenty-five years after the operation. I have only personal knowledge of one of my own cases performed about eleven years ago; he is at present perfectly well.

It may, therefore, be concluded, I think, that the prognosis is good, and that, so far as we are able to judge, Nature so adapts the altered conditions to her requirements that the ultimate course of life is neither shortened nor materially interfered with.

As regards the other operation referred to, that of total colectomy, it is difficult, if not impossible, to give a prognosis. But on purely physiological grounds the removal of so great a part of the alimentary canal must be regarded with a certain amount of misgiving. If we take no higher estimate of the function of the colon than that it is little more than a cesspool, even that may be a part which it has to play of no mean importance; and to deprive the body of such a system of probably sanitary significance is to remove something which may tell deleteriously in the long run on the general economy. However, the operation is of such comparatively recent date that we have hardly any means of determining its more remote affect. I can only record a case in my own experience performed for very chronic mucous colitis, where the patient now, four and a half years after, is fairly well in general health, and passing normal stools.

When we come to consider the prognosis of such operations as pylorectomy, the removal of variable lengths of the small intestine, short-circuiting between various segments of the alimentary canal, and nephrectomy, it is interesting, but possessing no importance beyond that which may be attached to the question of insurance. The operations, as a rule, are necessary to save life, and therefore to prolong it; but to what extent prolongation goes, or by how much in any particular instance the normal period of a life is shortened, it is in most instances quite impossible to say. We do, however, know this, that we cannot take away more than about six feet of small intestine without very soon observing marked metabolic changes; the lenteric stools, coupled with increasing emaciation, sufficiently attest to the fact that life is not being properly sustained. I well remember the case of a girl about fifteen years of age who suffered much from attacks of colicky pain in the abdomen, and other symptoms unmistakably suggestive of chronic intestinal obstruction. I opened the abdomen, and found that tubercular strictures were so

numerous and extended so far up the small intestine, that I had no other alternative, in order to give the necessary relief, than to short-circuit between the jejunum high up and the colon. So far as the operation itself was concerned and the immediate benefits it afforded, nothing better could have been wished for. She lived for about nine months, being, during this period, practically free from pain, ravenously hungry, and of quite a cheerful and happy disposition. But the stools were lenteric, emaciation rapid, and increasing weakness a symptom that finally carried her off. If, then, we are to venture on a prognosis based solely on the exclusion of different parts of the intestinal canal—I say “solely” on this aspect, because it must be remembered that there are possible intercurrent complications, as ulceration, stricture, &c.—it will be on the character of the stools; the nearer these approach to the normal standard the more favourable may be our forecast. There being a sufficient amount of intestinal secreting surface to meet the demands of healthy metabolic processes, life, it may be reasonably assumed, will not be materially shortened.

The formation of an artificial anus introduces several questions of interest. But first let me indicate exactly what I mean by an artificial anus. I do not mean a colostomy, or, as it is still sometimes called, colotomy, which is simply a fæcal fistula and which, if the obstruction beyond be not complete, tends to contract or close, but an opening which necessarily entails the entire discharge of the intestinal contents, and which, therefore, as time goes on, usually increases rather than diminishes in size. One of the principal problems with which we are confronted is this: Are we justified in making an artificial anus, say, for inoperable malignant disease of the rectum without very clearly indicating to our patient the physical inconveniences which such a procedure necessarily entails? Assuming, in the first place, that we are correct in our diagnosis that the disease is cancer and cannot be removed, we are morally bound to place the following facts before the patient: First, that death sooner or later is inevitable; second, that if relief is afforded by making an artificial anus, it must of necessity entail involuntary evacuation of fæces through the orifice; gases, both noisy in their exit

and offensive in smell, must frequently escape ; irritation of the skin around the opening is likely to take place, sometimes amounting to erosion ; the mucous membrane may protrude, and an increasing tendency to a general hernial protrusion of the bowel may result. It can well be understood how these very trying conditions must entail a forced exclusion of the patient from all social relationships—at least in that class where inconveniences of such a nature would be bound to play a very cogent part.

How variously affected patients are by considerations such as those just narrated. I may instance a few that have come under my own observation. I was asked to see a brother professional man suffering from intestinal obstruction. His age and the chronic nature of his symptoms led me to suspect carcinoma of the colon. Whether or not he had any idea of the possible condition present I did not know. He was of a very shy, sensitive, and reticent disposition ; and all he said to me, when I told him that operation was imperative if I was to give him relief, was, “ Whatever you do, don’t make me an artificial anus.” So far as the operation is immediately concerned, I may merely state that I removed a malignant stricture of the pelvic colon and established an anastomosis by intestinal invagination, and that he made a complete and rapid recovery. It was the late Sir George Macleod, Professor of Surgery in the University of Glasgow, who once said to me, “ If I had carcinoma of the rectum I would rather die than have an artificial anus made.” I recall a case under his care and treatment where a patient, finding the fæcal discharge so distressing, went out of his mind and committed suicide. Thus, then, it will be seen that medical men who may be considered to form a very reasonable estimate of the results of such an operation, are against its performance in the more intelligent, and therefore the more sensitive and susceptible, members of society. On the other side of the picture, however, there are aspects of the question which unmistakably show that an artificial anus may be the means of not only affording immediate relief, but of giving patients an existence which they readily tolerate and have in some instances subsequently even expressed their appreciation of. Let me give a couple of instances drawn from my hospital practice,

which further serve to show the minimum amount of discomfort it is possible to attain. One case was that of an unmarried woman, aged sixty-nine years, who was admitted into the hospital under my care in December 1904. She was suffering from an attack of acute intestinal obstruction following upon a chronic stage. She stated that up to a month of her admission her bowels had been regular and she had enjoyed good health, but that at this time she commenced to have pains in her abdomen and required to take aperients to obtain a movement of her bowels. She did not consider that she had wasted since the commencement of her illness. She was, however, seen on admission to be a very spare woman. Her abdomen was distended and tympanitic all over. Rectal examination revealed a large firm mass in the Pouch of Douglas, but whether or no it was connected with the rectum it was too high up to be determined by the finger. To obtain, therefore, a better idea of the relationship of the supposed growth and to do what might be considered necessary, the abdomen was opened. It was then found that, apparently, a growth occupied the pelvis, implicating the rectum on its posterior wall and invading the meso-rectum. Extirpation seemed unadvisable, if not impossible, and an artificial anus was therefore made. Without going into further details connected with the immediate and remote progress of the case, I will merely state her condition when seen seven years later, towards the end of 1911. She appeared to enjoy fairly good health, and daily attended to her household duties. Her bowels moved well through the artificial anus, but a little blood and slime occasionally came from the rectum through the natural opening. She suffered no pain, and expressed herself grateful more than once for the relief the operation had afforded her. What she was willing to put up with and bear with such cheerful resignation was represented by these local conditions: a general bulging in the region of the artificial anus about the size of a man's head; a local protrusion of the mucous membrane for two or three inches, and an occasional eczematous condition of the skin around the orifice; and all this with the involuntary evacuation of fæces through the artificial aperture. What the actual nature of the growth obstructing the rectum was I am not prepared to

say, but examination of the rectum with the finger showed it to be completely occluded and a mass could be felt rising up into the left iliac fossa.

The other case was that of a metal-worker, aged twenty-nine years, who had had an artificial anus made for advanced carcinoma of the rectum. When I saw him eighteen months after the operation he was enjoying comparatively good health, at his work, and in no way looking like a man suffering from the disease he was, or like one who was in any way distressed by the treatment he had undergone. By great care he had succeeded in regulating his bowels to such a nicety that he almost knew to within a quarter of an hour when they would move, and was enabled thereby to attend to his toilet conveniently. He had, further, kept the parts so clean that there was no excoriation of the skin ; and he had himself devised a support and protector to the part which enabled him to tell when his dressing was soiled.

It will thus be seen from the narration of these two cases, that we have no need to place only the gloomiest aspect of the side of the picture before our patients. Indeed such cases as these rather encourage us to mitigate the possible ills by indicating that, while immediate relief is likely, future discomfort need not necessarily be extreme : that it is merely an individual question as to what effort the patient is prepared to make in order to lessen such of those inconveniences which must necessarily ensue. The success of such an effort may be still further illustrated by a remarkable case recorded by Jordan Lloyd, where cæcostomy had been performed twenty years previously for a chronic inflammatory condition of the colon, which had practically obliterated the canal. Not a portion of foodstuff had passed into the large intestine, all fæces had made their escape by the cæcal anus, yet she had lived an active life ever since the complete relief afforded by her operation, enjoying good health, managing her domestic affairs, bringing up a large family, and taking an active part in her husband's business.

Before concluding these remarks on some of the problems connected with prognosis, I should like to refer briefly to a class of operations to which I think the term " mutilating " might be aptly applied, and which reasonably find

a place for consideration here. By mutilating operations I mean such as are performed for the removal of extensive foci of disease, and which, if successful in their immediate results, leave the patient in a crippled condition for the rest of life. A big operation has always within it something very tempting to the young and enthusiastic operator ; and it is only as experience increases that his doubts begin to be awakened, and he questions with himself the propriety, and even rightness, of pitting his own secret desire to do something great against the well-weighed welfare of his patient. But even to the experienced the problem is not always so easy to solve as at first sight it might appear, for it need not necessarily follow that complete success in our removal of an extensive area of disease should result in a mutilating effect upon our patient. It is the too greater probability of failure in these big operations that is the real embarrassment of the situation, and renders it questionable whether we should ever have made the attempt at all. However, it is more with those cases where we know for a certainty that, however successful we may be, we must leave our patient in a more or less mutilated state, that the propriety of performing the operation comes in. The question which arises here is much the same as that which was asked in the case of the performance of an artificial anus : Were we justified in performing the particular operation proposed without clearly placing before the patient the probable or possible result that would accrue from our endeavour, apart altogether from the immediate gravity of the operation itself ? I even think that there are cases where our own judgment may be the better criterion, if we honestly consider the best interests of our patient and not the success of any surgical accomplishment which may temptingly present itself to us. I shall better illustrate my meaning by describing the following case, which will also serve to indicate what I mean by a mutilating operation. A young girl was admitted to my ward suffering from intermittent attacks of abdominal pain, frequency of defæcation, and with blood and mucus in the stools. She was only twenty-two years of age, distinctly good looking, with a fair complexion and a hectic flush in her cheeks. She was of an exceptionally bright and cheerful disposition, and seemed to have no other thought

in her mind than that she was going to get well. Looking at her, one's first thoughts were that she was a tuberculous subject; and, considering her symptoms, that she was suffering from tuberculous ulcers and strictures of the intestine. These, however, were the facts after closer investigation of her symptoms. Digital examination of the rectum revealed a typical and advanced carcinomatous stricture of the rectum situated about two to three inches from the anus. The abdomen was opened above the pubes, and an examination of the pelvic viscera revealed the fact that the uterus was invaded by the growth in the rectum, and that the disease extended back in the meso-rectum to the lower part of the sacrum. Here, then, were the problems with which I was confronted. First, she was ignorant of the true nature of the disease, hidden to her and only known to me as the result of my examinations; and second, if I operated I must sweep away the uterus, the rectum, and part of the sacrum if complete extirpation was to be aimed at, with the probability even then that I may not have rid the patient of the disease, and the certainty that I should leave her a sterile woman with probably incontinence of fæces. I confess I did not feel justified in submitting so young a patient to such an existence of possible misery for whatever period she might subsequently live. Nor, further, did I feel I had any right to make use of the knowledge I had in a way secretly obtained to blight her hopes of recovery or quench the spirit of joy and pleasure in life she so remarkably manifested. Nature had not yet made known to her her fatal verdict, and I felt I had no possible right to usurp her prerogative. The only treatment I adopted was to pass rectal bougies, not, unfortunately, without causing her considerable pain; but I hoped thereby to ward off obstruction, the symptoms of which as yet were only slight; and so when death did come it might be due to the less painful consequences of hæmorrhage, perforation, or gradually increasing asthenia. Thus, then, my patient left my charge hopeful and cheerful, to remain so until such time as Nature deemed it expedient to make known her mortal intentions. Was I right in thus dealing with such a case? I think so.

Exploratory Operations. Exploratory operations are usually employed as aids to diagnosis, and often to admit

of prognosis ; they form, therefore, a fitting appendix to the subject of this chapter. Apart, however, from the connections just indicated, they in themselves open up questions well worthy of consideration. I know of hardly any greater mistake than to regard an exploratory operation, as is too frequently done, a performance of comparative minor import ; indeed, as only a harmless additional measure in the ordinary routine of diagnostic investigation. Of such moment have I come to regard these particular operations, that I consider they should not be undertaken except under the clearest indications that, but for their performance, neither the necessary knowledge can be obtained nor the requisite treatment carried out. Let me, therefore, give my reasons for such a comparatively strong statement. First, we can never be certain that the line of division of the peritoneum made in our incision through the parietes will not in the process of healing lead to the adhesion of the bowel, the mesentery, or the omentum. In other words, that fibrous bands or adventitious membranous attachments will be formed capable of giving rise to subsequent trouble. That this is no mere conjecture is amply borne out by what we find in reopening the abdomen at variable periods after previous intra-abdominal operation ; and how, still further, these adhesions have in themselves been the very cause for which our secondary operation has been called for. Again, an exploratory operation performed with no definite indication of the possible nature or seat of the disease as a guide, leads to an amount of manipulation of the abdominal contents which it is impossible to regard without a sense of the risk that is being run. It is a strange fact, and yet I believe it to be actually true, that the perfectly healthy peritoneum is more sensitive to serious infection than that which has already suffered from the irritative influences of some kind of visceral lesion.

Further, we must not ignore the fact that if from some, it may be, inexplicable reason our parietal wound does not heal by primary union, or that from some purely mechanical cause—such as post-operative vomiting, coughing, restlessness, straining, &c.—the line of union is stretched, we may have, as a subsequent complication, the formation of a ventral hernia.

There is yet another drawback to an ill-advised exploratory operation, and that is, that the wound may become invaded or infected by the disease within the abdomen. For instance, a tuberculous peritonitis may leave a tuberculous fistula, and carcinoma may invade and actually protrude through the weakened and non-resisting line of wounded tissue. I have seen, for example, a carcinoma of the stomach produce a fungating mass in the line of the incision made through the epigastrium for exploratory purposes. Another result also of opening the abdomen in advanced cases of malignant disease is the liability of the wound to fail to heal. The reparative power of these patients is frequently at such a low ebb that not only may the wound be sluggish in healing, but so susceptible of infection that it is not uncommon for it to become septic.

The simple conclusion of the whole matter, therefore, is this: that unless we can clearly see that by opening a patient's abdomen we are adopting a measure that is distinctly to help us in gaining some more requisite knowledge than that which is already made known to us by other evident symptoms, we are not justified in doing so. This, expressed more tersely, implies that mere curiosity is no justification for an exploratory operation. It must have as its sole reason the practical attribute of necessity, or at least of expediency.

CHAPTER III

ABDOMINAL INCISIONS

It was in the November of the year 1898 that I performed the operation of gastrorhaphy for a dilated stomach. The case at the time seemed of sufficient interest to record, and it was accordingly published in the *Lancet* (vol. i, p. 952). It happened in the case that, owing to considerable internal hæmorrhage from the exploratory incision in the

stomach, I was obliged to reopen my abdominal wound. This latter had consisted of a median incision between the ensiform cartilage and the umbilicus, and a second one passing transversely to the right, dividing a considerable portion of the right rectus muscle. The wound healed with a result which showed a perfectly secure and non-yielding cicatrix of the transverse incision, but marked tendency to hernial protrusion in the median one. It seemed at first as if this was directly opposed to what one would have expected; for the free division of the muscle, with its supposed tendency to retraction and separation of its margins, ought to have left a gap much more conducive to a hernial protrusion than in the case of the median line, where only fibrous tissue had been severed. Further reflection brought to my mind other instances of secure, non-giving cicatrices in which the rectus muscle had been divided. I refer more particularly to the left medio-oblique subcostal incision which I, in common with many others, have employed for performing cholecystostomy. It was these facts that led me to weigh more carefully the relative merits of incisions carried through the abdominal parietes.

But before I say anything further about the clinical value of, more particularly, transverse incisions, I should like to clear the way by a brief description of the anatomy of the abdominal parietes; for it is only by a proper appreciation of the structure and function of the parts which go to make the great outer covering of the abdominal viscera that justification can be found for departing from the almost stereotyped practices of the past.

A reference to the two figures will render it much easier to follow the text. They were kindly made for me by Dr. Macphail, late Professor of Anatomy at St. Mungo's College, Glasgow, now Lecturer of Anatomy at St. Bartholomew's Hospital, London. The first figure (Fig. 3) shows the modes of distribution of the muscles, their sheaths, and methods of attachment. The three great abdominal muscles—the external oblique, the internal oblique, and the transversalis—are fleshy at the side of the abdomen, but as they extend forwards anteriorly they end in what is technically known as their aponeuroses. While the fibres of the fleshy parts of these muscles assume different directions, the fibres of the aponeurotic portions take practically the same

course—that is to say, for the greater part they run transversely, only taking a somewhat oblique direction as they

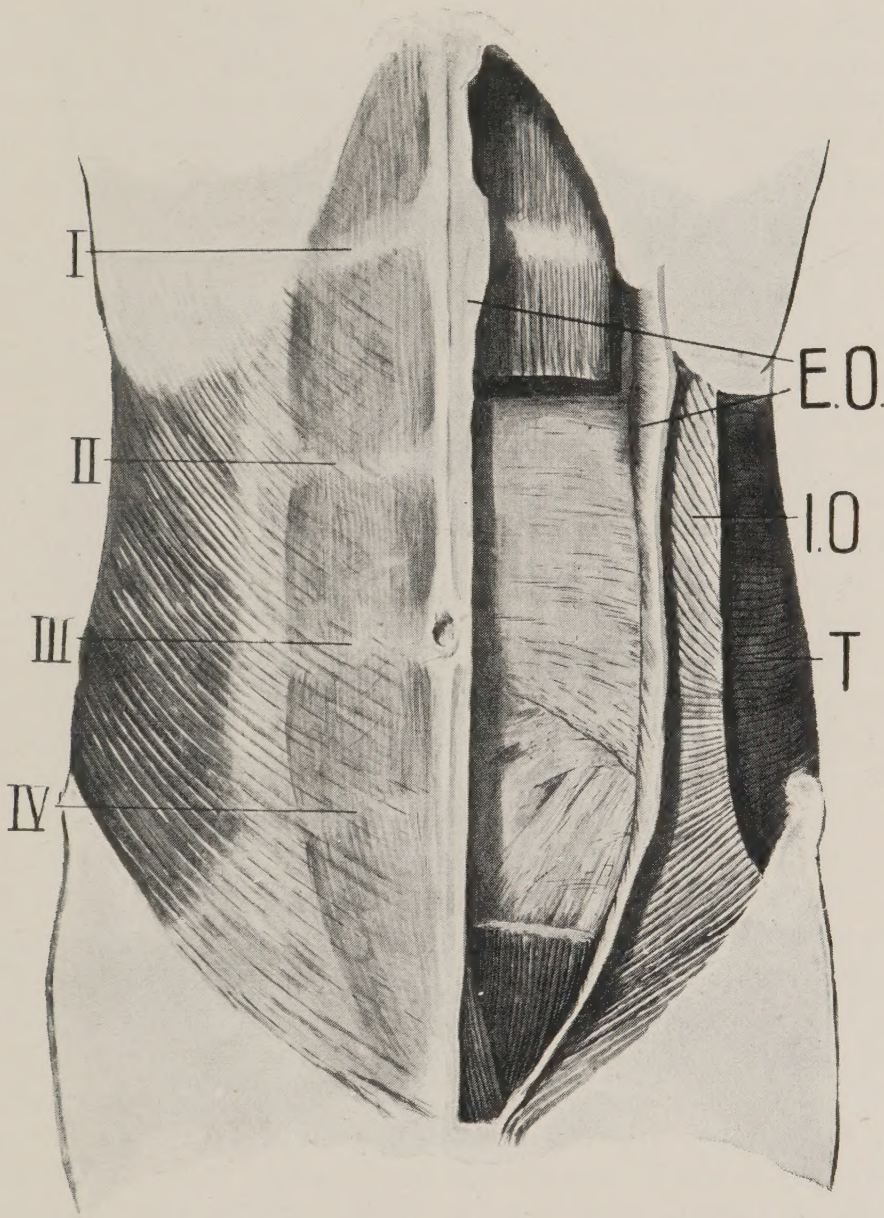


FIG. 3. Muscles and aponeuroses of the anterior abdominal parietes. I, II, III, IV, Lineæ transversæ; E.O., external oblique and anterior sheath of rectus removed to show rectus muscle (partly removed) and posterior sheath with Fold of Douglas, the sheath being continued to pubes; I.O., internal oblique, also partly removed to show T., transversalis muscle. (Alexander Macphail.)

approach the median line for about two inches above the pubes, and for about the same distance below the ensiform

cartilage. Further, while the fleshy portions of each muscle form distinct and separate layers, the fibrous parts are inextricably united together at the outer border of the rectus. At this particular line—known as the *linea semilunaris*—this conjunction of fibres splits longitudinally, and interpolated in this division courses the rectus muscle. A reunion of the aponeurotic fibres takes place at the inner margin of the rectus; and, finally, a particularly firm junction is effected between the aponeurosis of each side. This line constitutes the *linea alba*. It is stated in most text-books on anatomy that at a point about midway between the pubes and the umbilicus the aponeurosis on each side no longer splits, but all the fibres pass in front, leaving, therefore, a free transverse fibrous margin known as the *Fold of Douglas*. This fold, however, is by no means constant, for in operating one constantly finds that the aponeurosis behind the rectus extends down to the pubes, forming thereby a sheath for the recti for their whole extent. When, therefore, these three powerful muscles contract, the whole force of their action is brought to bear upon the long central aponeurotic tendon.

The remaining muscles of the anterior abdominal parietes are the two recti, which strictly possess no sheath of their own, but are merely enclosed in the split tendons of the oblique and transversalis muscles. But there is this fact to which I wish to direct special attention, that intersecting the recti muscles are certain aponeurotic lines, known as *lineæ transversæ*; and the special point is that these fibrous bands “are firmly united to the anterior wall of the sheath of the muscle” (Quain). These tendinous intersections are at least three in number—placed one opposite the umbilicus, another on a level with the ensiform cartilage, and a third intermediately between them, with sometimes a fourth and a fifth placed below the umbilicus. Thus, then, contractions of the recti may be considered segmental, each portion between a pair of *lineæ transversæ* acting practically as a separate muscle. The clinical bearing of this fact will be alluded to later.

Now if the second figure be looked at (Fig. 4), it will be seen to represent the vascular, nerve, and lymphatic supply of the anterior abdominal parietes. With the exception of the nerves, which course forwards, and therefore have a

more or less transverse direction, the blood-vessels and lymphatics have a course upwards and downwards. Towards

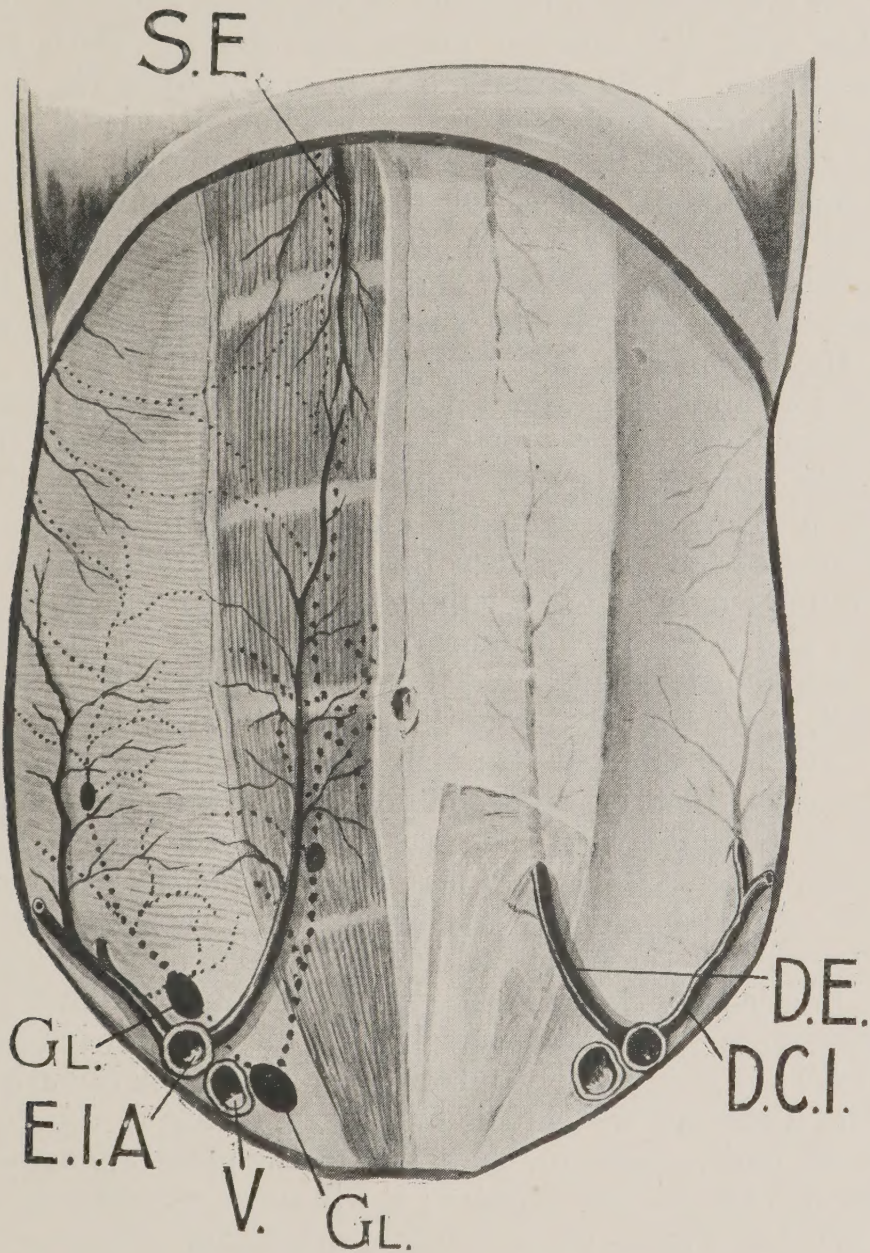


FIG. 4. Blood-vessels and lymphatics of the anterior abdominal parietes. E.I.A., External iliac artery; V., vein; D.E., deep epigastric artery; D.C.I., deep circumflex iliac artery; S.E., superior epigastric artery; GL., lymphatic glands. The lineæ transversæ are seen well marked crossing the right rectus muscle. † They are four in number. (Alexander Macphail.)

the lateral aspects, however, the blood-vessels and lymphatics take a similar course to the nerves, and pass

backwards. The arterial supply of the antero-lateral parietes is particularly abundant through the free anastomosis, which takes place on each side between the deep epigastric below and the internal mammary above. Both these vessels also freely anastomose laterally with the intercostal, lumbar, and deep circumflex iliac arteries ; but as their respective branches approach the middle line they become mere capillaries which do not communicate with those of the opposite side. Thus, then, the linea alba is practically non-vascular, and equally destitute of lymphatics. As regards the vascular and lymphatic supply of the cutaneous and subcutaneous structures of the anterior abdomen, the middle line, unlike the deeper corresponding aponeurotic portion, does possess these vessels, only very sparsely distributed.

If a firm, well-organised cicatrix depends upon the absence of tension between the freshly united margins of a wound, upon the free supply of blood to and from the part, and upon a ready absorption of exudates by means of abundantly distributed lymphatics, then it may be asked, How are these conditions best fulfilled in the case of incisions carried through the anterior abdominal parietes ? Clearly, from purely anatomical and physiological considerations, as has above been shown, the median line possesses to a less degree than any other part these assumed requisite conditions. On the other hand, if we consider the line in which these particular conditions are fulfilled to the utmost extent, it must undoubtedly course more or less transversely. An incision, for instance, which runs transversely outwards from the neighbourhood of the umbilicus will, in the first place, course in the direction of, and parallel to, the fibres of the great aponeurotic tendon of the oblique muscles ; it will sever several branches of the deep epigastric or internal mammary vessels ; and will also divide innumerable ramifications of the lymphatics. As the aponeurosis is not cut crossways, as in a median incision, contractions of the great oblique and transversalis muscles do not put tension of a separative character upon the margins of the wound. Further, the abundant blood-supply leads to a more rapidly formed cicatrix, and to a better organised one, than where there is a deficiency of good nourishment ; and such exudation as necessarily

takes place between the edges of all wounds is the more easily taken up and removed by means of the ready access to distant parts which the large supply of lymphatics affords.

But the question which very naturally presents itself is, What about the recti muscles? Theoretically, it would certainly be reasonable to suppose that a complete division of the fibres of one or both recti must leave a weakened scar, because of the supposed retraction of the muscle-fibres after division. But what really happens is that the retraction which does actually occur only concerns the particular segment that exists between two lineæ transversæ. It will, therefore, be understood that separation of the fibres below the umbilicus is likely to be greater than above, because of the possible absence of any well-marked lineæ intersecting the muscle between the umbilicus and the symphysis. What, therefore, happens in the process of healing is pretty much what already exists naturally—that is to say, an artificial or adventitious linea transversa is constituted, and of a particularly firm character, especially above the umbilicus; for fibrous adhesions are formed, not only between the divided muscle margins, but between these margins and the overlying aponeurosis.

So far I have contrasted anatomically and physiologically median and transverse incisions, but a few words are necessary on vertical incisions other than median. There are not wanting advocates for incisions carried downwards slightly on one or other side of the median line; and others, again, who advocate incisions coursing along the linea semilunaris. These have their advantage over the median in that they course in regions where the vascular and lymphatic supply is better; but in common with the median they involve the division of fibres of the mid-abdominal tendon transversely. It is also sometimes argued against them that the nerves going to the rectus are severed, so that this muscle is paralysed, and therefore tends to the production of hernia. There may be some truth in the supposition, but I more incline to the belief that the chief check to hernial protrusion is absolute intactness of the aponeurosis; so long as that membrane has not been weakened in any way, simple paralysis of the muscle-fibres of one or more segments will not afford the necessary laxity to admit of any bulging.

I shall now venture to answer clinically the two questions which most naturally present themselves. The first is, Is there any good reason for departing from the old-established and almost stereotyped practice of opening the abdomen by a median incision? And the second is, What advantages are offered by employing the transverse incision? It will at once be observed that the two questions involve answers that may be considered as much applicable to the one as to the other, for to give one reason for departing from the median incision is probably to give the same for adopting the transverse. I shall, therefore, not attempt to differentiate very specifically.

Any surgeon who has set himself the task of carefully investigating the results of his median abdominal incisions not less than eighteen months or two years after their execution, cannot fail to have been impressed with the number of post-operative herniæ that existed. Successful as everything may appear at the time and for some weeks and even months after, the subsequent giving of the cicatrix and the formation of a hernia becomes a source of constant and lifelong discomfort, if not sometimes of positive danger. It is a proof, at least, that success in one respect has not been so complete and lasting as desired; and while the disease for which the operation was primarily executed may have been cured, it has been followed by another trouble, the direct result of the means employed for the treatment of the original complaint. One reason, therefore, for departing from the median incision, and I might even add the chief reason, is an endeavour to avoid this late result of post-operative hernia; and this same reason is given for using the transverse incision, because, as I shall later show by reference to cases of some standing, such adverse results do not seem to accrue to a like extent.

Another advantage which the transverse incision seems to have over the vertical, more particularly in operations involving the removal of the female generative organs, is that more room is obtained. A curved incision carried transversely across the lower part of the abdomen gives much more room for dealing with the lateral pelvic regions in a panhysterectomy; and by readier accessibility to the parts, it is possible to be much more expeditious. It will be found, also, that a transverse incision in the mid-

epigastric region will give better access to all parts of the stomach than can be gained by a median.

The median incision has certainly some advantages over the transverse, in so far as it concerns the time occupied in opening and closing the abdominal cavity; and, when time is a serious consideration in any case, there can be no question as to the propriety of selecting the middle line. In the opening there may be no vessels to tie, and in the closing only a single series of through-and-through interrupted sutures to introduce. For cases of acute intestinal obstruction, acute perforation, advanced malignant disease, or any other condition where the patient's powers are undermined, rapidity of operation is imperative; and median incisions, therefore, the right ones to employ.

Again, there are undoubtedly occasions when a lateral vertical incision may fulfil requirements not to be obtained by a transverse. Thus, it is by no means an uncommon position to find ourselves in of being in doubt as to whether the condition complained of is appendical, pyloric, or cholecystic. When so placed, a vertical incision down the right linear simulnaris will enable us to inspect all these regions, and adopt—by further extension of the incision upwards or downwards if necessary—such radical treatment as may be required.

Should, for some reason or other, the abdominal parietal wound become septic—and no matter how great our precautions it will sometimes—the advantage of the transverse incision is striking. I believe I am right in saying that it is quite the exception for a median incision which becomes septic to form a cicatrix that will not subsequently give and be the source of a post-operative hernia. On the other hand, I can assert most positively that a badly septic transverse incision may form an absolutely non-giving cicatrix. I have had evidence of this, or I should not venture to express myself so strongly. But the reasons given for the good quality of the transverse cicatrix, the result of healing by first intention, become applicable even with greater force to those cicatrices which have healed by granulation. It is that the cicatrix becomes well organised by reason of the rich vascular supply and the ready absorption, by the abundantly distributed lymphatics, of the inflammatory exudates, anatomical

conditions, as already shown, which do not exist in the middle line.

I have now answered my questions, and given what I think may be fairly considered good anatomical and physiological reasons for preferring, in certain cases, transverse to vertical, and more particularly median, incisions.

Lest I should be understood as speaking too optimistically or too confidently on the value of these particular incisions, it should be borne in mind that failures will occasionally be met with ; but in nearly every instance some reasonable explanation is forthcoming. In some cases the interrupted sutures used for uniting the edges of the aponeuroses have led to irritation and been slowly ejected, by which means the apposing margins of the wound have been allowed to gape. In others, again, the patient has been permitted to rise too soon ; or, what is much worse, to engage too soon in active work or exercise. These two latter causes will be found to be probably among the commonest ; and when brought to bear upon wounds that have healed by granulation and not by first intention, they are almost certain to be followed by a weak cicatrix with its attendant ills of a ventral hernia.

Neither must I be taken as speaking too pessimistically of vertical incisions, for there is no denying the absolute security with which many of these are accompanied ; and when employed for conditions which have entailed great distension of the abdomen, and therefore great stretching of the parietes, the resulting cicatrix is often perfect. The reason for this is the complete and persistent laxity of the wound edges during the process of repair.

The true value of any method is not convincingly proved by the plausible explanations put forward in its support, but by the practical clinical result shown in gaining the end required. It is now fifteen years since I began making transverse incisions of the abdominal parietes, and since then I have used them in hundreds of cases. I, at first, watched my cases carefully, taking every possible opportunity to examine cicatrices at variable periods after operation, in order to make absolutely certain that I was advisedly and justifiably adopting a procedure otherwise so completely contrary to customary practice and so against all previous teaching. For, however apparently

correct both anatomically and physiologically, it must be shown to be sound in its results. Time only seemed to convince me the more strongly that the practice was right ; and when I was able to see perfect success in one of the most advanced cases in which the transverse incision was employed three years after its execution, I felt nothing further was needed to justify its use. This case I introduced at the annual meeting of the British Medical Association

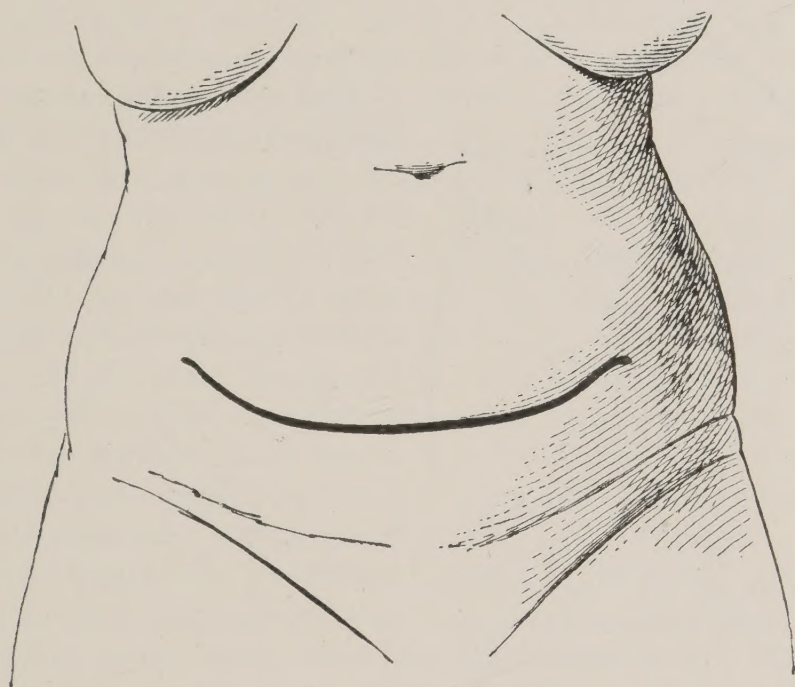


FIG. 5. Ten-inch transverse incision for the removal of a large uterine fibroid ; both recti muscles were completely cut across. (From a photograph taken by Dr. John Anderson.)

at Exeter in August 1907, when reading a paper on the same subject. The patient was a woman aged forty-nine years, with a large uterine fibroid. Both recti muscles and their sheaths were divided completely across. The diagram (Fig. 5) is taken from a photograph.

Conclusions. I cannot do better than now briefly give the conclusions which, I think, may be reasonably drawn from what has been said.

(1) When time is not of *paramount* importance, more permanently secure cicatrices result from transverse than vertical incisions, whether median or extra-median.

(2) Transverse incisions afford more room for the treat-

ment of pelvic diseases, and are also better for exploratory purposes.

(3) Vertical incisions involve the division of fewer blood-vessels, and the wound can be closed by a single series of through-and-through interrupted sutures. For

these reasons, therefore, they can be executed much more expeditiously than the transverse, and should be employed in all cases where time is a serious consideration.

Technic of Transverse Incisions. In dividing the sheath of the rectus, the chief end to be aimed at is to carry the incision as much as possible in the line of the fibres of the aponeurosis. Thus, in the upper part of the abdomen for, say, two inches from the xiphoid, the incisions should course obliquely from above downwards and outwards. In the lower part of the abdomen for, say, two inches from the symphysis pubis, the incisions should be carried upwards and outwards. In the central part of the abdomen—that is, between those parts just delineated—the incisions should be transverse. The diagram (Fig. 6) represents these various incisions.

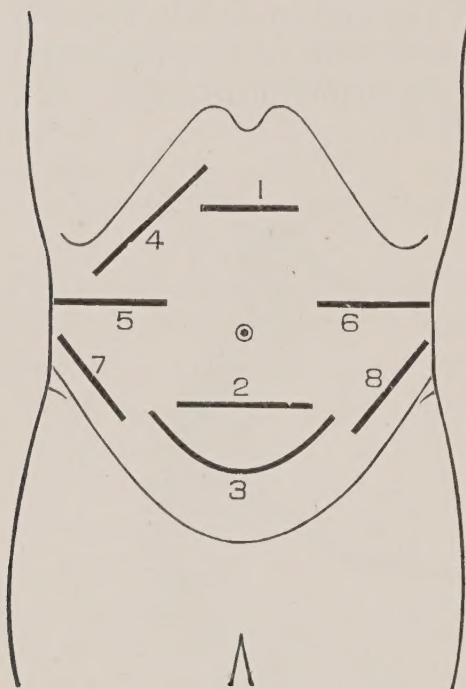


FIG. 6. Diagrammatic representation of transverse, oblique, and curved incisions. 1, For stomach and first part of duodenum; 2, for whole colon, including cæcum and appendix; 3, for pelvic organs; 4, for gall-bladder and ducts, including pylorus; 5, for kidney; 6, for kidney and spleen; 7, for cæcum, appendix, and right adnexa; 8, for iliac and pelvic colons and left adnexa.

An essential factor in ensuring success in all transverse incisions is the accurate coaptation of the free divided margins of the aponeurosis. This applies with as much force to the aponeurotic layer behind each rectus muscle as to that in front of the same. In securing the posterior edges, the parietal peritoneum should be taken up with the fibrous layer; and in uniting the anterior edges, some

of the stitches may with advantage be passed through the divided edges of the muscle, and some even through the line of union of the posterior layer. The object of this is to obliterate the space which is apt to exist in some cases between the divided ends of the muscles. This space, unless obliterated, is liable to become filled with blood and serum, which oozes from the raw edges of the divided tissues, and may need to be subsequently let out. It has never in my experience led to any subsequent insecurity of the cicatrix. Another kind of accumulation which occasionally takes place in this space is that of gas. How it gets there I am at a loss to explain except it be from the blood. It will sometimes give quite a marked elevation to the united skin edges. A probe forced through gives ready exit to the gas, which is quite scentless and quite innocuous in its effects. It should be pointed out that one way to avoid these occurrences is not to divide the muscle-fibres if sufficient room can be acquired by simple forcible retraction of the rectus on each side. It frequently happens that by dividing the aponeurosis freely in front and behind the recti these muscles can be sufficiently drawn aside without it being necessary to cut any of their fibres.

As regards coaptation of the skin and subcutaneous margins, I am in the habit of employing mattress sutures in all cases where there is much adipose tissue. The principal object aimed at is not only the better union that is likely to follow the bringing of the deeper parts into direct contact, but the prevention of a space in which liquid fat and extravasated blood are otherwise apt to accumulate ; indeed, to better avoid this contingency, I think it is advisable to insert a drainage tube for the first forty-eight hours or so. I should like to describe a kind of mattress suture I am in the habit of using, and which, I think, has certain advantages that render it of considerable value. Its method of application will be readily followed and understood by referring to the diagrams (Figs. 7, 8, 9, 10, and 11). The stoutest strands of silkworm gut are selected. A large curved cutting-needle threaded with one strand enters the skin about one inch outside the cut margin, sinks down obliquely inwards to the aponeurosis, crosses the floor of the wound, enters the opposite side, and takes a circular grip of the subcutaneous fat, re-enters the edge

of the same side, and makes its exit through the skin about the same distance from the wound and about one inch from the point of entrance. This is then tied in the

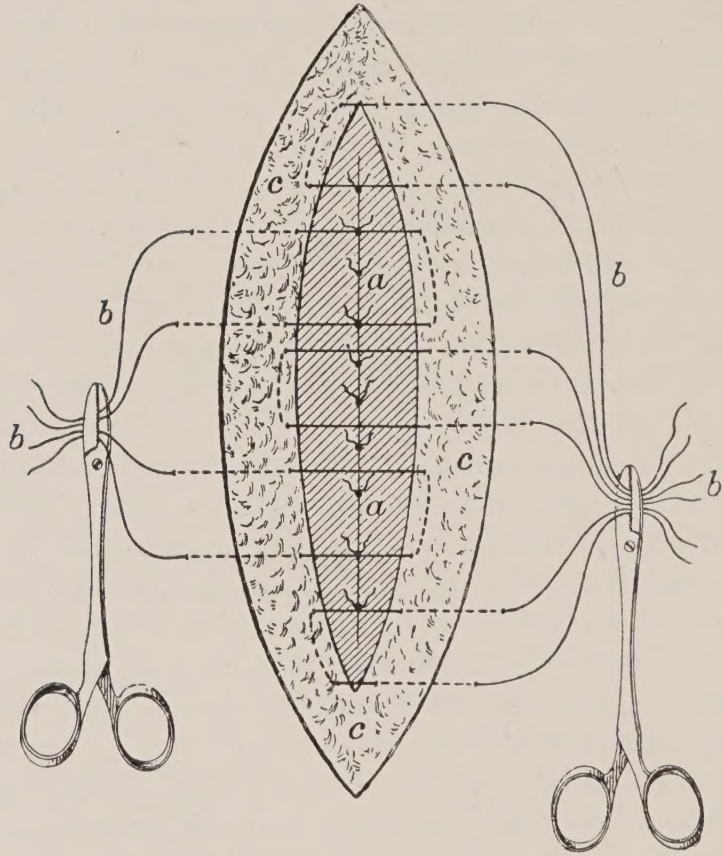


FIG. 7. Diagrammatic representation of closure of abdominal wound by means of specially applied mattress sutures. *b, b, b, b*, Mattress sutures inserted ready for tying; *a, a*, series of interrupted aponeurotic sutures; *c, c, c*, raw edges of skin flaps.

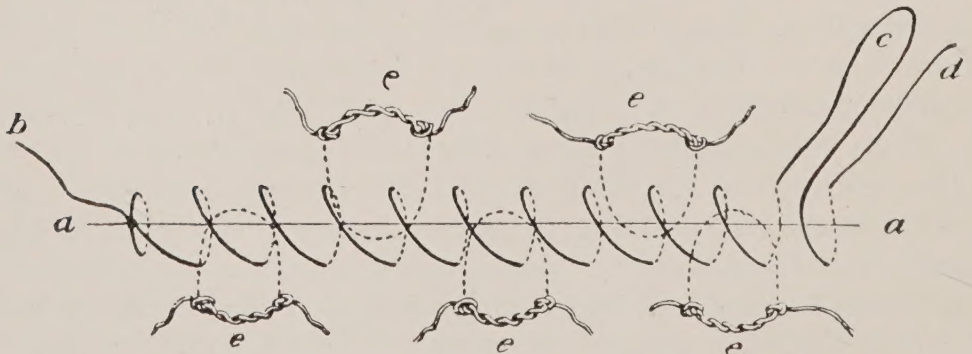


FIG. 8. Diagrammatic representation of transverse wound after tying all sutures. *a, a*, Line of incision; *b*, continuous coapting suture with *c*, loop, and *d*, end left long for final knotting; *e, e, e, e*, loops of mattress sutures.

way shown in the diagrams (Figs. 9, 10, and 11). The result of such a stitch is that it approximates the deep parts of the wound, and therefore obliterates any possible space ;

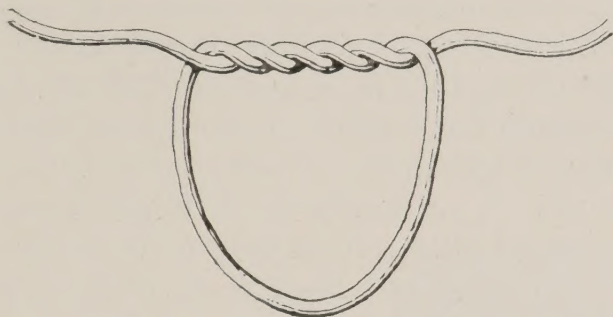


FIG. 9. First stage in tying mattress suture.

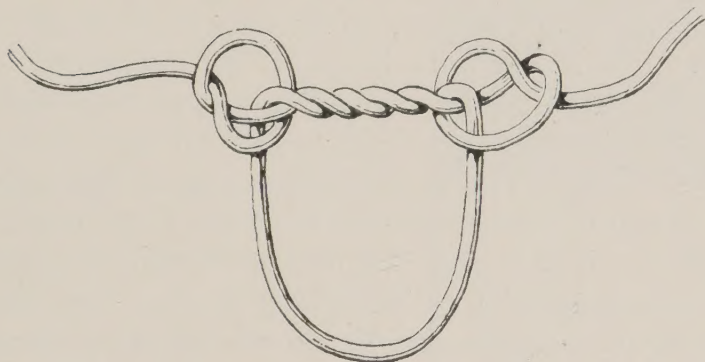


FIG. 10. Second stage in tying mattress suture, showing how the lateral knots are made

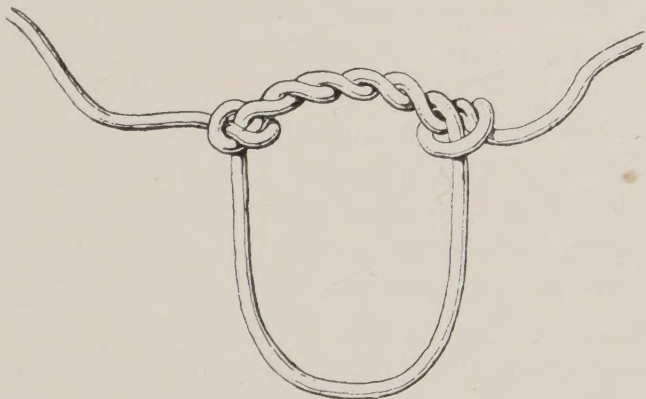


FIG. 11. Completed stage in tying mattress suture; shows looping of the suture between the two end-knots.

and, further, when tied it does not cut off the blood-supply to the skin margin embraced by it. These mattress sutures are usually taken out on the fifth day, for by that time they begin to cut into—that is, the end knots do—the tissues ; but apart from that, they will have sufficiently

subserve the ends for which they were employed. In their removal, care should be taken to cut the suture well under one or other of the end knots, or removal will not be possible. The nature of the sutures in general use is, to my mind, a matter of no little importance ; and I may quite fittingly introduce here, once and for all, the materials I am accustomed to employ in my abdominal work. One general principle upon which I invariably act is not to bury any suture that is incapable of absorption. I know that in this practice I differ from that of some good operators who, for instance, do not hesitate to use silk for ligatures and deep sutures alike. My objection to buried silk is that I have known it, after months of quiescence, suddenly, from no explicable cause, give rise to irritative effects, and either eject itself or have to be extracted. On the other hand, it must be owned in its favour, and in this lies the chief advantage claimed for it by its advocates, that it holds much longer than such absorbable material as catgut. My only answer to this is that gut properly chromicised and of suitable size will last sufficiently long for any purpose of coaptation. Should a wound become septic, both kinds of sutures are liable to be troublesome, and necessitate removal before healing will continue. Silk, I think, more readily becomes infected than gut, which, by reason of its compactness and density, offers greater resistance to invasion. There is one distinct disadvantage of chromicised gut, and that, the possibility of its being over-chromicised. Like all commercial products, as the demand increases the original care taken in preparation diminishes, and so a less reliable article is the result. This is what has happened with this particular gut. The over-hardening is recognised by the excessive stiffness and brittleness of the material. When this condition of the gut exists it should be discarded, not only from the fact that it is physically unreliable, but because it is capable, I believe, of proving a source of irritation to the tissues.

The difficulty of sterilising catgut, so frequently advanced as a reason for not employing it, is, I feel, quite successfully overcome by the method of dry heat. I first saw this method of preparation carried out in Vienna ; and although it is several years ago, my adoption of it ever since has led me, more and more, to trust the reliability of the process.

The present apparatus I use is called a "dry oven" (see Fig. 12), obtained from the British Prometheus Company, Limited. It is heated by electricity taken off from any ordinary lighting socket. The heat is capable of variation by means of a three-power plug, the powers being known as "maximum," "medium," and "minimum." A thermometer placed in the top of the oven records the degree of temperature. My present steriliser has been in use for six years, and has not once failed to register the required temperature. That the gut is effectually sterilised has been repeatedly shown by submitting it to cultivation experiments. From time to time a hank of chromic gut sterilised in the dry oven is sent to the pathological department for examination, and although tested by the most sensitive bacteriological processes, it has always been shown to be quite free from micro-organisms. I subjoin a description of the materials and their mode of preparation given to me by my theatre Sister, who has sole charge of them.

I have tried to give a just and very impartial opinion of the relative merits of absorbable and non-absorbable sutures and ligatures; but these agents, like so many other practical details in the performance of an operation, are usually successful in proportion to the care and interest taken in them by the individual operator. Each man has his own fads and fancies, and as long as he faithfully and diligently practises his own methods his results are generally as good as those of any one else. Nature seems always to favour those who strenuously strive to do their best for her; and perhaps that is the reason why she tolerates so many different methods, and accords to each the same success.

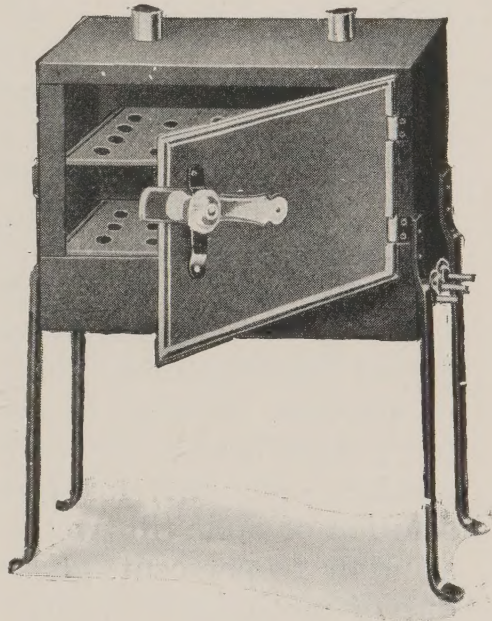


FIG. 12. "Dry Oven," heated by electricity, for sterilising chromic catgut.

Methods of preparing Sutures and Ligatures. "Sulphochromic catgut (improved process) as prepared by J. F. McFarlan and Co., Edinburgh, in strands each ten feet long, in four sizes—00000 (very fine), 000, 0, and 2 (stout). Enclose each strand separately in an envelope sealed with carbolic (1 in 20). The 'Dry Oven' is brought to a temperature of 140° C. with the power plug at 'Maximum.' The envelopes are then placed inside the oven and the temperature again raised to 140°, when the connection is changed to 'Medium.' At this heat it is kept for twenty minutes. The envelopes are then taken out and stored in glass-covered jars until required for use. The gut is removed from the envelopes with sterilised dissecting forceps and placed for twelve hours prior to the operation in carbolic (1 in 20). The sizes most in use are the No. 000 and No. 0; the former is employed for deep ligatures and for all intestinal suturing, while the latter is for tying pedicles and for suturing the abdominal aponeuroses. In preparing raw catgut (Hartmann's), steep in ether for forty-eight hours; in alcoholic solution of mercuric chloride (1 in 1000) for forty-eight hours; in juniper oil, two parts, and absolute alcohol, one part, for forty-eight hours: store in fresh solution of same till twelve hours before use, when soak in solution 10 per cent. glycerine (sterile) in alcohol. Serve out of methylated spirit. Sizes 1 and 2 most generally used for ligatures.

"The silk used is that prepared by Archibald Turner and Co., Limited, England, in sizes 1, 2, 3, 4, and 5. The silk is loosely rolled on glass slides and boiled for thirty minutes, then kept in carbolic (1 in 20). Size 3 is generally used for the continuous skin suture of clean abdominal incisions.

"Silkworm gut and horsehair are enclosed in gauze, and boiled for thirty minutes.

"The tubes mostly used for drainage are the ordinary rubber ones. After a general cleansing process they are placed in long open glass tubes capable of holding several sizes twelve inches in length. These tubes are plugged at both ends with gauze, and sterilised for twenty minutes in superheated steam."

For some beginners it may be of use to know the kind of needles employed in ordinary abdominal work, so to the above account furnished by my Sister I may add the

following: Full curved intestinal, sizes Nos. 8 and 11, threaded with No. 000 sulpho-chromic catgut, and No. 10 straight intestinal needle threaded with the same-sized gut, used for all anastomotic purposes and for suture of the peritoneal edges. Full curved cutting, No. 6, and straight cutting, No. 2, threaded with No. 0 sulpho-chromic catgut for suture of aponeuroses, with silkworm gut for skin-stitching, and also with silk for the same purpose.

CHAPTER IV

HERNIÆ OF THE ABDOMINAL PARIETES : THEIR CAUSE, PREVENTION, AND TREATMENT

THE unfortunate frequency with which herniæ are associated with abdominal incisions renders the subject a fitting sequel for discussion to the preceding chapter.

While inguinal herniæ strictly come under this heading, inasmuch as they are protrusions of the abdominal viscera through the abdominal parietes, they form too separate and distinct a class for consideration here, and will therefore be omitted.

Causes of Hernial Protrusion through the Abdominal Parietes. All herniæ coming under this heading are strictly of the acquired variety; that is to say, with the exception of the slight umbilical bulging in infants, there is no congenital sac of peritoneum pre-existing for the reception of extruded viscera. It follows, therefore, when a hernia takes place there must exist two factors to favour its appearance: (1) some weakened area in the parietes, and (2) forces from behind to act as propelling powers. There is no question which is the more cogent factor, for only under very exceptional conditions the powers of propulsion are normal; that is to say, they are constantly taking place at all periods of life, and could have no deleterious effect if there were not a previously weakened area in the parietes upon which they could exercise their baneful influences. But these powers become factors of much

greater importance when considered in relation to preventive measures to be taken after operation. These, however, will be considered later. In considering cause, therefore, it is a question of investigating the various reasons for the existence of weakened areas in the parietes. One clinical fact stands out prominently, and that the frequency with which umbilical and ventral herniæ are found in women who have borne several children. Except for occasional and almost rare examples met with in men, and for post-operative herniæ, nearly all the cases that we have to treat are situated in and around the umbilicus, and along the mid-line, in stout multipara. This proves that the weakness is due to overstretching, and that this overdistension tells most upon the umbilical cicatrix. Often it is the first pregnancy that creates a small bulging, not, perhaps, larger than a hazel-nut or a walnut; but this with each succeeding pregnancy gradually enlarges, until a time arrives when the size of the swelling may equal or even exceed that of the human head. It is remarkable how often the protrusion of bowel and omentum is through two or more openings situated close to and involving the umbilicus. Sometimes, however, the aperture is single and presents a tense ring at, or slightly above or below, the umbilicus. These so-called umbilical herniæ present the most varied clinical features. They may be very irregular in shape, with elongated pouch-like projections. In consistency they are sometimes dough-like, solid, or elastic—conditions depending upon the nature of the contents, which are usually either omentum or bowel or both. They may be merely a source of physical inconvenience, but often give rise to pain and irritation of the skin; especially is this latter symptom troublesome where folds of skin overlap; and they are always a menace to life from the fact that strangulation is an ever-present contingency. The co-existence of excessive obesity, so frequent in these cases, adds yet another factor in gradually increasing the dimensions of the hernia. The abdomen becomes pendulous, and the weight of the fat acts as a *vis a fronte*, so that it appears sometimes as if more of the patient's bowels were without than within the abdominal cavity.

There is another form of hernia, similarly the result of

multiple pregnancies, where the protrusion is in the mid-line between the umbilicus and the pubes. It is due to great stretching and consequent thinning of the linea alba. The projection is uniform and oval in shape, and the contents of the hernia mostly small intestine. These weak abdomens, for they are more often that than really herniæ, need not cause much inconvenience, and never possess the gravity of the true umbilical form.

The kind of hernia which has now come to be only too frequent is that dependent upon a weak cicatrix, the result of an abdominal incision. A well-organised and closely knit cicatrix should leave the abdominal parietes as sound as if no incision had been carried through it. But a cicatrix the result, not of primary union, but of healing by granulation, and of stretching during the process of repair, is almost certain to fail in withstanding the normal forces productive of pressure and tension. By a well-organised and closely knit cicatrix I mean one which has as its natural borders the fibrous tissue of the aponeurosis. With these the newly formed cicatricial tissue, in a sense, welds, and becomes so intimately associated that cicatrix and aponeurosis become one tissue. This definition is important because it implies the obverse fact that unless the tissue on either side of the newly organised cells be of practically the same connective tissue structure, it will not form a non-yielding cicatrix. Thus, for instance, if an incision is carried across the fibres of a muscle which has neither in front nor behind it aponeurotic fibres, the result will, in a sense, be possibly perfect union and healing by first intention, but the dissimilarity of the two tissues—the fibrous and the muscular—will not admit of a welding of the two in such a way or of such a kind as to secure a non-giving line of union. This is precisely what happens when a vertical incision is carried through the side of the abdomen. Here the great abdominal muscles are coursing more or less transversely inwards towards the middle line; there are no aponeurotic sheaths or tendons; and the result of such incisions—no matter how well they heal—is invariably a hernia.

Except, then, for the reasons just given, in what may be termed a particular class of cases, the weak cicatrix is dependent on causes that lead to other considerations

which may quite properly be discussed under the heading of

Prevention of Herniæ of the Abdominal Parietes. The umbilical and ventral forms of herniæ first described, arising as they do from more or less natural causes, can hardly be considered as those capable of prevention. The following remarks, therefore, have sole reference to post-operative herniæ.

One of the commonest causes of a weak post-operative cicatrix is a septic wound, with the usual result, prolonged ejection of sutures ; and another almost equally common cause is the delay in healing due to the use of drainage either by tube or gauze (*see* Fig. 32). While the former suggests that every effort should be made to prevent the margins of the wound being infected, the latter cause is lessened in proportion to the smallness of the calibre of the drainage tube and the quantity of the gauze employed for packing. It is essential that the drainage should be efficient, and the gauze packing no more than absolutely requisite ; there is no need to exceed these requirements by the use of unduly large tubes and a great quantity of gauze packing, for to do so is only to court the production of big herniæ and the necessity of subsequent operation. Still further, drainage should not be prolonged beyond the shortest possible period required. It is rarely that five days need be exceeded, but the amount of the discharge and the patient's temperature are the best criteria to go upon. If the discharge is markedly lessening and the temperature normal, it is usual for the tube to have established a sufficient canal for drainage at the end of four or five days.

The weakening of a cicatrix from too early stretching of the new cementing material is one, I venture to think, of the commonest failings in the after treatment of abdominal incisions. I cannot see the advantage of allowing patients to rise at comparatively short periods after operation. It is argued by those who advocate such a course that the normal exercise of the muscles tends to make a better cicatrix. I confess that I am at a loss to understand how. The only wound that seems to me to admit of any such treatment being at all reasonable is that of the so-called "gridiron" incision made in either the right or left iliac fossa. Here there is a crucial separation of both the muscular

and tendinous fibres, and a pull, therefore, in two different directions when the muscles contract—actions which may possibly tend to better close the opening. But under nearly all other circumstances tension will tend to make the wound gape, and unless the cicatrix is perfectly secure it will certainly do so.

My rule is to maintain the patient at rest for four weeks in cases where the wound has healed by first intention; but when healing has been by granulation, the result of some of the causes already mentioned, detention in the recumbent position for six weeks or longer is enforced. This rule, however, is not without its exceptions. For instance, a simple, uncomplicated appendicectomy, carried out through a comparatively small gridiron incision, and in which healing has taken place by primary union—such a case may very properly be allowed to rise at the end of a fortnight. And, again, patients whose abdomens have been opened for malignant disease, and where such disease has proved non-removable, it is hardly right to subject them to such a severe and prolonged routine of rest, when life may, in many cases, have not a very long period to run.

A very good sign of a perfectly and securely healed wound is the absence of any sign of hardness in the deeper parts when examined by digital pressure. The significance of this symptom is that it indicates that complete organisation of the cementing material has not taken place, and that the cicatrix is in a condition, therefore, to stretch if any strain is placed on it. If, therefore, the case is one in which permanent security is of paramount importance, a cicatrix should not be considered non-giving until the sense conveyed to the examining fingers is similar to that felt in neighbouring parts.

There are some surgeons who allow their patients to rise a few days after an abdominal operation. The practice is, I believe, more frequent abroad than in this country. As I have already stated, I fail to understand where the advantages or advisability of such a practice comes in. I have heard one reason given, that the pressure for the admission of patients into a large hospital was so great that cases once operated upon had to be dismissed at the shortest possible notice. That, however, hardly touches

the question of doing the utmost good for the individual case. If it is really a matter of obtaining the best possible result, then to allow a patient to rise before union of the sutured margins is sound and non-giving is to court the future production of a ventral hernia. But, apart from this consideration, there is another factor which appeals more, perhaps, to the humane side of the operator's relation to his patient than to the technical accomplishment of which he, too, may feel justly proud. It is that he regards his patient more in the light of a living, sensitive being than a mere pathological specimen. The physical and mental rest entailed by a comparatively prolonged period of enforced recumbency, good nursing, and careful feeding, in one who may for long previously have been an invalid, is a true source of constitutional recuperation. I have heard it said, and I quite believe it, that an attack of appendicitis, with its consequent treatment by appendicectomy, has proved an unexpected and unmitigated blessing to many a busy man, who, but for the compulsory detachment from his labours and the enforced recumbency thereby entailed, would never have obtained the rest he so much required. However, when the rest is not essential, and a return to active life, in the shortest possible time, is necessary, I suppose the American gentleman who had his appendix removed in seven minutes, "was out of bed on the third day, and gave a dinner to friends down town on the fifth day," forms a sufficiently exciting but doubtfully safe precedent for others to follow if they wish, but hardly one which most surgeons, I should imagine, would venture to accept as sound.

There are many other sources of tension and strain, besides those dependent upon too early rising after operation.

To get a fairly good idea what these are, let me ask any one to lie flat on his back with his legs extended ; to place the outspread palm or surface of the hand on the anterior abdominal parietes ; and then to try various actions to find when the muscles contract. He will ascertain these facts : that the walls become stretched and hardened when he coughs ; makes abortive efforts to retch or defæcate ; tries to raise his pelvis and abdomen by resting on his shoulders and heels ; attempts to elevate his chest ;

or endeavours to turn on to his side. Every one of such acts must have an injurious effect upon a wound that has not securely united, and has to trust to its security to the stitches used at the operation. If, then, we wish to prevent these influences, we must adopt such practical measures as the following : Do not operate if the patient has a cough that we have reason to believe can be cured or considerably lessened before operation is necessary. Have the bowels well cleared out before operation ; and then, if no movement has taken place by the fourth day after operation, obtain an evacuation by the administration of rectal enemata. As regards aperients by the mouth, employ such as the patient is accustomed to take as being probably those which will act most efficiently and with the least discomfort. Failing any selection on the part of the patient, castor-oil is the best to give, as it is less likely to cause straining during evacuation.

The elevation of the abdomen for the application of bandages or for toilet purposes is often most thoughtlessly executed. The patient lying in the extended position is frequently told to raise himself for the objects just indicated, and no aid is given to help him to do so. He may remain in this position for some time, and not infrequently until he can do so no longer from sheer exhaustion. Now, this harmful detail in the dressing or toilet of a patient can be quite easily and efficiently overcome by first making him draw the legs well up, so that with the soles of the feet still on the bed the thighs are flexed nearly to a right angle on the abdomen. In this position elevation of the pelvis and the abdomen is both easy, and free from causing any tension effect on the parietes. Assistance may be still further given, in the application of bandages, by the folded fist of a nurse placed under the sacrum upon which the patient can rest.

Perhaps the greatest strain that can be put upon a wound is that which follows the unaided effort of the patient to try and sit up. Such an effort, therefore, should be strictly forbidden until the wound can safely stand the strain. One of the most trying ordeals which a patient is often made to endure after an operation is to be kept rigidly on the back for twenty-four hours. There is the greatest possible difference in the way in which patients

suffer in this respect. When it is so bad that the patient cannot sleep for the pain in the small of the back, and this in spite of the support of a pillow under the lumbar vertebræ and the use of morphia, he should be moved on to his side, not, however, *told* to turn over. The voluntary effort of turning the pelvis causes abdominal tension, but the passive movement involved in lifting the patient into the semi-prone position does not disturb the laxity of the parietes.

I have left the consideration of the prevention of retching and vomiting to the last, because, without question, it is one of the most troublesome and most harmful of all the agents capable of weakening a cicatrix, and so predisposing to the production of herniæ. Inasmuch as the administration of the anæsthetic has very largely to answer for the appearance of these after-symptoms, it occurred to me that I might acquire some helpful information by appealing to one or more expert anæsthetists. I accordingly put the two following questions to Dr. J. Fred. W. Silk, one of the leading anæsthetists in London, and to Dr. David Lamb, who for more than ten years has been chief anæsthetist to my hospital and to me in my private abdominal work. First: "Do you know of any anæsthetic or method of administration which would enable you to say that, in any particular case, you could with certainty prevent post-operative vomiting?" And the second: "Do you know of any anæsthetic or method of administration that will diminish the chances of post-operative vomiting?" In answer to the first question I received an emphatic negative reply from both. In answer to my second question, Dr. Silk favoured me with the following opinions. In the first place, he attached considerable importance to the proper preparation of the patient. In most particulars this corresponds to the measures fully described under the heading of "Pre-operative Treatment," and need not, therefore, be repeated. But there are three points which Dr. Silk discusses worthy of attention. The first of these is his disapproval of routine lavage immediately before operation except it be for fæcal vomiting or regurgitation; under other circumstances he considers it does more harm than good. His reasons for objecting to the practice is that it stimulates the stomach secretions; and

since these are further stimulated by the anæsthetic, the tendency to after-sickness is apt to be increased rather than diminished. In the second place, Dr. Silk disapproves of the administration of morphia prior to the operation, because it acts as a depressant to the respiratory and circulatory systems; tends to mask the symptoms due to the anæsthetic, for the pupils remaining contracted may lead to over-saturation of the patient with the anæsthetic; and because it does not check after-sickness, although it may delay it. In the third place, Dr. Silk considers the administration of strychnine, either by the mouth or hypodermically, prior to operation, advantageous, for it is an excellent tonic and indirectly modifies the tendency to after-sickness.

With regard to the nature of the anæsthetic and method of administration, I will quote Dr. Silk's own words: "I consider that chloroform is essentially *the* anæsthetic for abdominal surgery, especially above the umbilical level. In gynæcological and rectal surgery, herniæ and appendix cases—that is to say, for parts below the umbilical level—I prefer the mixture (chloroform 1, ether 2). Ether has, I know, been given in these cases with success, and especially of late, since the so-called 'open method' has been pushed so indiscriminately. But I think that this success does greater credit to the skill of the administrator than to his judgment. Of methods, I prefer on the whole the 'open' or 'drop' method. I have given the so-called 'dosimetrical' method with a Vernon Harcourt Inhaler a prolonged trial, with and without oxygen. It is quite admirable in very many cases from every point of view, but in not a few instances it has failed in my hands both generally and in the matter of after-sickness. I am inclined, therefore, to say that the 'open' method gives more reliable results."

In regard to after-treatment, Dr. Silk attaches considerable importance to the careful removal of the patient from the operating-room to the bed; the patient should not be jolted nor abruptly turned from side to side.

Dr. Lamb favoured me with the following reply to my second question. He, like Dr. Silk, attaches considerable importance to the preparation of the patient; but as the

measures proposed are practically those described under the heading of "Pre-operative Treatment," they need not be restated.

As regards the kind of anæsthetic and the method of administration, I quote Dr. Lamb's own words: "I am of opinion that severe and prolonged sickness is more frequent after chloroform than after mixtures of chloroform and ether, or after pure ether, though with the latter slight sickness is more frequent. I am convinced that the minimum of sickness is met with after the careful administration of ether by the 'open' method."

With regard to after-treatment, Dr. Lamb further expresses his opinions thus: "From observations of a series of major operations, after each of which an intravenous injection of two pints of normal saline solution was given, I formed the opinion that by aiding elimination and counteracting shock this procedure assisted greatly in the prevention of after-sickness. A similar object is attained by surgeons who give copious draughts of water during the days immediately preceding and following operation, and by those who give large or continuous rectal injections of saline after every case."

In reading these replies, while impressed with their more or less unanimity, I am struck with the omission of one cogent consideration, and that, that modesty has probably induced both anæsthetists to refrain from attributing a good deal of the success of an administration to the personal equation. As a surgeon criticising the anæsthetist, I am satisfied that the experienced administrator plays a very important part in the prevention of post-operative vomiting. It stands to reason that giving a patient just so much as is required, and not saturating him with the poison, must go a long way towards attaining the desired results; and therefore I feel that if post-operative vomiting is a sequel to be avoided as much as possible, we must employ the expert administrator.

Before passing from the subject of anæsthesia, it is not without interest to refer to a method of administration which among other claims has that of rarely being followed by vomiting. I allude to the transfusion method introduced by Burckhardt, and more recently warmly advocated by Mr. Felix Rood, of University College, London.

It consists in introducing into the venous system a 5 per cent. solution of ether in normal saline.

Treatment of Herniæ of the Abdominal Parietes. That much support may be given by the use of properly fitting trusses, abdominal belts, &c., there is no doubt, and they are the only means that can be employed in many cases. They have, however, several disadvantages. They frequently limit a patient's actions; they are apt to get soiled, and then become a source of irritation to the skin. Their worst feature is that in course of time they may slacken and fail to give the needful support. When this is the case they may positively become a source of harm, if not of actual danger. If, for instance, the rupture should slip by the margin of the edge of the pad, it will tend to increase the size of the opening, and so make retention still more difficult. It may be truly said that a badly fitting truss or belt is worse than no support at all. With these drawbacks, therefore, to the use of any purely mechanical contrivance, when operation can hold out better prospects it should be performed. It is surprising what excellent results can be obtained in the treatment of some of those enormous umbilical herniæ occasionally met with in very stout women. I will give two examples of cases which will serve to illustrate also the kind of operative treatment executed. In one case, a woman aged fifty-three years and weighing 14 st. 6 lb. (*see* Fig. 13), the hernia was large and the abdomen pendulous. Transverse elliptical incisions were carried across the abdomen 21 inches in length, enclosing a mass of tissue which after removal weighed 10 lb. 11 oz. The operation was performed in 1903, and when I last saw her, four years after her operation, there was a perfect non-yielding cicatrix. In the second case, a woman aged forty-two years and weighing 15 st. 9 lb. (*see* Fig. 14), there was also a large umbilical hernia with a great pendulous, fat abdominal parietes. The incisions were of the same length as those in the first case, but the total amount of fat and tissue removed less—6 lb. 2 oz. She, like the former woman, made an uninterrupted recovery. In both these cases, as in several others of a similar nature which I have operated upon, the sacs containing the herniæ were multilocular with parts of omentum inseparably united to their lining walls.

It may be stated, as a general practice to follow, that as long as the bowel is freed there is no need to trouble about detaching the omentum ; indeed, it is better to tie it off and remove it with the sac. Quite independent, however,

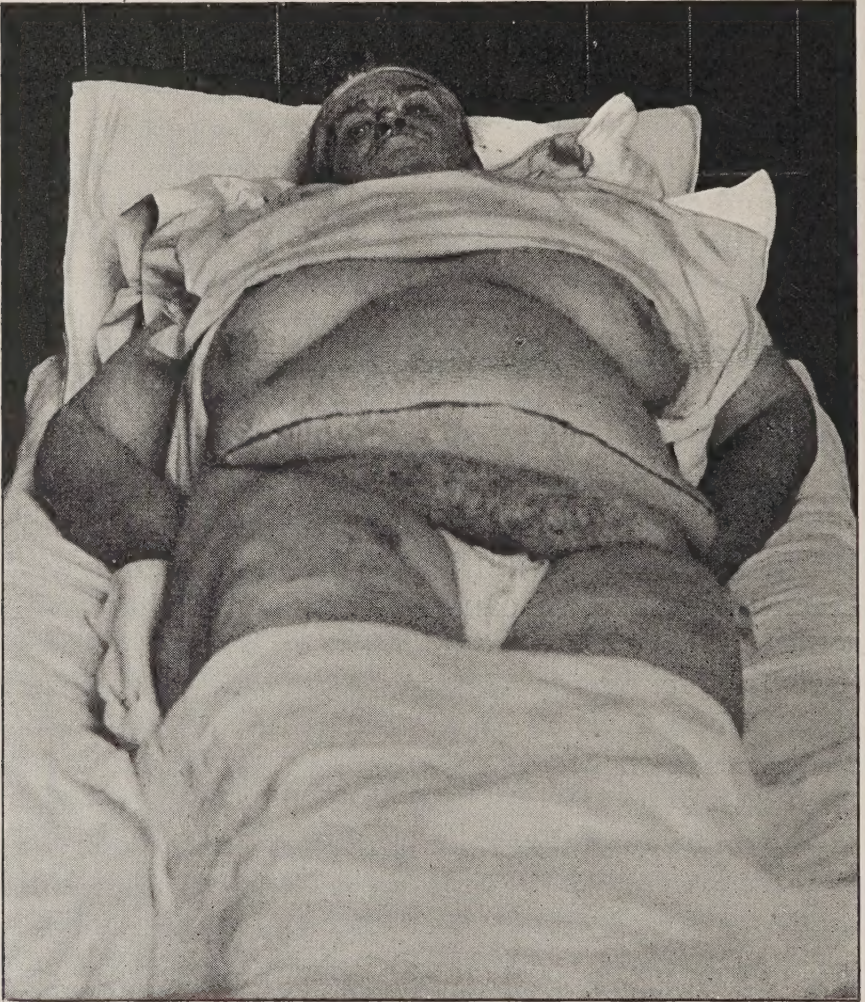


FIG. 13. Twenty-one-inch transverse incision, with removal of 10 lb. 11 oz. of adipose tissue, &c. Operation for large umbilical hernia. (Photograph taken by Dr. John Anderson.)

of the adherent omentum, it is wise, and often really necessary, to remove a considerable quantity of this redundant membrane in order to facilitate the return of the bowel and render possible the efficient occlusion of the aperture. Where there is much subcutaneous fat there is always a quantity in the omentum and the mesentery. The method of closing the hernial opening in the apo-

neurosis will be described later, but I may add here an item in the after-treatment of these excessively obese cases which I think is worthy of consideration. It consists in an effort to reduce intra-abdominal pressure by lessening generally the total amount of adipose tissue. This I have tried to do by keeping the bowels freely open, by enforcing

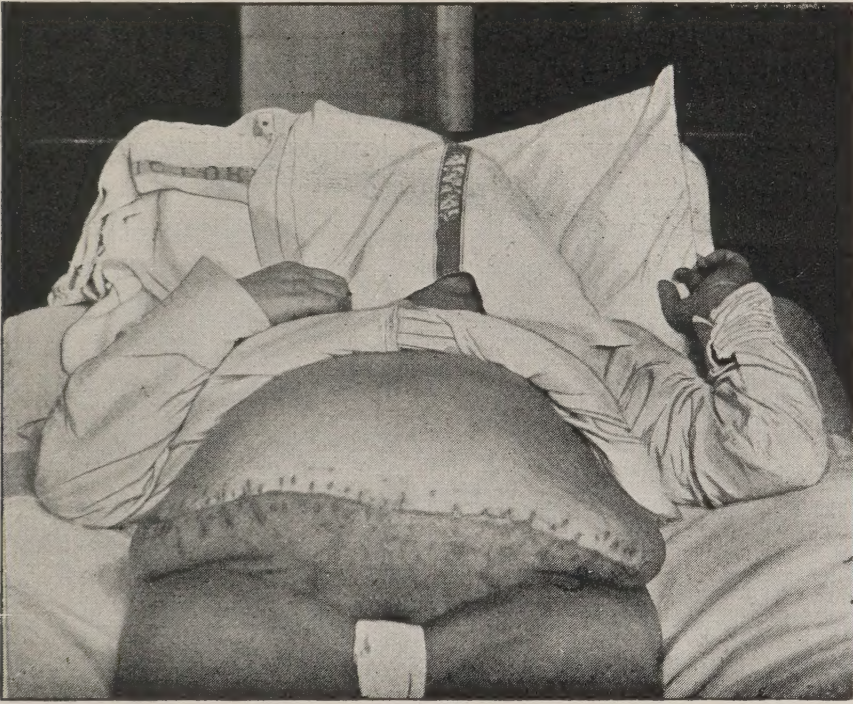


FIG. 14. Twenty-one-inch transverse incision, with removal of 6 lb. 2 oz. of adipose tissue, &c. Operation for large umbilical hernia. (Photograph taken by Dr. John Anderson.)

a strictly limited and carefully selected diet, and by administering thyroid extract.

It is not out of place in this connection to say that I have, since my first operation in 1903, quite independently of operating for hernia, removed large quantities of subcutaneous fat from the anterior abdominal parietes in order to lessen the physical discomfort so often experienced by these subjects—a discomfort that has its origin in an eczematous state of the skin lying between overlapping folds. I called the operation “lipectomy.” It is such a common-sense procedure that doubtlessly others have preceded me in practising so safe and simple an operation, and one withal which affords so much subsequent relief.

In some cases of less degree than those just described, where the contents of the sac are little more than the transverse colon, I have adopted the following plan, based on the fact that the chief agent in the production of the hernia is the tendency of the colon itself to protrude; and if that tendency could be prevented a cure would be much more likely to follow than by doing nothing more than closing the opening. The principle of the operation is to pull down the omentum so that the transverse colon is displaced from its customary position. This is accomplished in the following way. A long, slightly curved needle with handle attached is made to perforate the parietes a little above Poupart's ligament and about two inches from the anterior superior iliac spine. By means of the finger of the left hand within the abdomen the needle is guided upwards until it is sufficiently within reach to be threaded with the two free ends of the suture previously inserted to secure the omentum. The needle being withdrawn and the suture pulled upon the omentum is brought down to the parietes, and consequently with it for a certain distance the transverse colon; here it is secured by tying the suture over a small roll of iodoform gauze. There may be a slight element of subsequent risk about the operation from the fact that an omental band is formed over which a loop of intestine might slip and cause obstruction. I have done the operation several times, but not to my knowledge has any after-mishap occurred. The risk, therefore, I think must be slight, and probably less than that connected with the possible recurrence of the hernia due to the propulsive proclivity of the transverse colon.

The method of closing the hernial aperture in the aponeurosis will, perhaps, be best understood by a reference to the diagram (*see* Fig. 15). After freely exposing the neck of the sac and the aponeurosis around, liberating, returning, and removing as much of the contents of the sac as may be deemed expedient, a sufficient amount of the sac wall in the neighbourhood of the aperture is left to admit of two aponeurotic flaps remaining which will be capable of overlapping each other. It will sometimes be found advisable to extend the hernial aperture on each side so as to avoid awkward doubling, and allow the two flaps to apply themselves more evenly. I usually carry the lower

flap up under the upper one, where it is secured by a sufficient number of interrupted sutures. These sutures are passed thus : One end of the suture threaded in a full-curved bowel-needle is passed first through the base of the

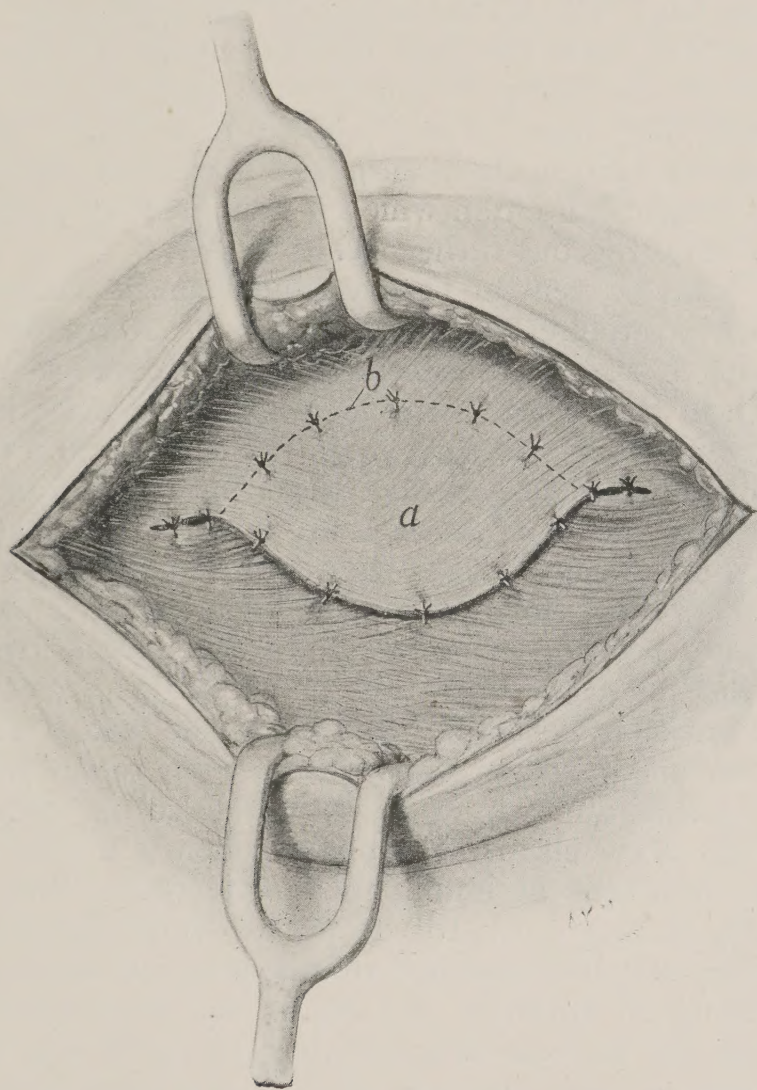


FIG. 15. Method of closing the aponeurotic aperture in umbilical or ventral hernia. *a* represents the aponeurotic flap which is brought over and stitched to the base of the under-flap, which itself is secured along the dotted line, *b*.

upper flap, and then made to take up a small loop of the lower flap fairly close to its free edge but quite sufficient to get a good grip ; the needle now reperforates the base of the upper flap close to where it entered. When, therefore, the two ends are drawn taut, the lower flap ascends well up under the upper, and is securely fixed there by

tying the suture. As many sutures of this kind are passed as may be required to bring the whole flap into position. The edge of the upper flap is, lastly, pulled down and stitched by a series of interrupted sutures to the base of the lower flap. The under-surface of the upper flap, which is in contact with the raw fibrous surface of the aponeurosis of the lower, is lined with peritoneum. I do not think that there is any objection to this; indeed, knowing how readily the peritoneum forms firm adhesions, the free plastic exudation which it is capable of producing may be advantageous rather than otherwise.

That form of ventral hernia which consists mostly in an undue stretching of the linea alba requires different treatment to that just described. It is more frequently met with in thin women who have borne several children, and there is, therefore, what might be considered a redundancy of the parietes. When these patients strain it is noticed that the recti muscles are widely separated and displaced outwards; and if the required support is to be obtained, it must be by replacing them in their original and natural position on each side of the middle line. To do so the following operation is necessary. A curved vertical incision is made embracing the whole hernial protrusion and reaching outwards to each rectus muscle, thus enclosing an oval mass of tissue to be removed. Where the rectus sheath is double—which it usually is to half-way between the umbilicus and the pubes, and very frequently is also down to the pubes—each layer should be carefully stitched together, that is, posterior to posterior and anterior to anterior. In one of my cases treated as described, the vertical incisions were 15 in. in length and the amount of tissue removed $2\frac{1}{2}$ lb. I saw the patient two years after, when the cicatrix was perfect, with no signs of yielding. Success, however, in this class of cases is only likely to be permanent when the operation is performed after the child-bearing period is over, or in the event of there being no further pregnancies; for the cicatrix in the middle line is hardly likely to withstand the stretching consequent on a full-timed pregnancy.

I have no experience of the use of silver-wire gauze in the treatment of some forms of intractable abdominal hernia, but from the success which seems to have attended

its employment in the practice of some surgeons it is worthy of notice. The gauze is embedded in the tissue of the parietes in such a way as to prevent, by its supposed non-giving character, protrusion through an aperture incapable of occlusion by the natural tissues.

The treatment of post-operative herniæ depends largely for its success on the situation of the lesion. Thus, for those which occur in the lateral regions of the abdomen where there is only muscle and no fibrous aponeurotic tissue, operation is practically useless. But under all other circumstances it is usually possible to give relief. The principle aimed at is the *reposition* of the parts distorted and displaced by the gradually distending effects of the protruded viscera. There should therefore be a free exposure of the neck of the sac, complete removal of the latter, and coaptation of the margins by a series of interrupted sutures. In cases of hernia following upon operations for the appendix, excellent results are obtained by this method of operating.

In all cases of herniotomy for post-operative herniæ even more care is required in after-treatment than in the case of other forms. For that reason, therefore, to keep a patient in bed for from six to eight weeks is erring on the safe side.

In conclusion, let me add that patients who have undergone abdominal operations should for some time after avoid as far as possible any work or pastime that is likely to place a strain on the cicatrix.

CHAPTER V

GENERAL REMARKS : PRE-OPERATIVE, OPERATIVE, AND POST-OPERATIVE

BEFORE dealing with special organs, their diseases and their treatment, it will lessen considerably the details necessarily connected with the latter if a description is first given of those practices which may be regarded as

common to all. I shall discuss them under the three headings of preparations prior to operation, the operation itself, and after-treatment.

General Pre-operative Remarks. The remarks will be best divided into two sections : first, that which concerns the patient ; and second, that which has to do with the operator and his assistants.

Preparation of the Patient. No abdominal operation should be undertaken upon a patient without due regard being given to its possible gravity, and a proper appreciation of the necessary risks it entails. While this is the frame of mind the operator should possess, it is not that with which his patient should be imbued. I have already indicated in a previous chapter how powerful is the influence of the state of the patient's mind on the immediate and remote effects of an operation. And therefore in the interests of our patient, as equally in that of our own to attain success, we should encourage as much as we can, and minimise the risks, however great they may be in our own estimation. For a patient to have a good night's rest before an operation because of the helpful assurances previously given, is incomparably better for all concerned than that he should have one which has been restless and wakeful, and possibly spent in fear and anxiety.

The administration of food and the evacuation of the bowels always receive attention, but not always with judicious forethought. To weaken by extreme starvation or by, what is equally as depleting, excessive purgation is to place a patient at a serious physical disadvantage to meet the demands of a prolonged and severe operation. In both instances, therefore, a primary knowledge should be obtained of the foods the patient most easily digests and of the aperients which he has been accustomed to use. With this information food of an easily digestible kind and in reasonable quantity may be administered the day prior to the operation, and not less than three hours before operating some fluid food should be given—beef-tea or chicken-tea, with a little dry toast soaked in one or the other. Milk is apt to curdle in the stomach and form an indigestible solid, and frequently patients are met with who have a positive distaste for it. With regard to aperients, an effort should be made to disturb the patient as little as

possible ; and this, I think, is best attained by giving the aperient about nine or ten o'clock in the evening of the first night of the two preceding the day of operation. The bowels will not be likely to move until the next morning, so that the patient, therefore, may have an undisturbed night. A whole day is, thus, also allowed for the effects of the drug to completely pass off. An hour or so before the operation the rectum should be washed out with warm water enemata, not only for the purpose of acting as an evacuant, but as a suitable preparatory measure to the administration of nutrient enemata should they be deemed desirable.

As far as the patient is concerned there now only remains the preparation of the skin. As a preliminary procedure, all hair should be shaved from the surface of the parietes and from about the external genitals ; a free washing with soap and water and then drying the skin completes the initial part of the process. The second stage in preparation is the sterilisation of the skin. Many different methods are employed. At present I believe the one in most universal practice is the application of tincture of iodine of strength varying from 2 to 5 per cent. The solution is freely brushed over the whole abdomen about an hour or so before operation, and again just prior to making the incision. It must have a fairly powerful irritant action on the skin, for usually a good deal of surface epithelium peels off a few days after the operation. I adopted this method for some time, but for reasons mentioned below I have largely discarded it. I do not know that it is in any way specially superior to other methods, which for the time it seems to have superseded. I wonder why sometimes we so readily departed from the use of carbolic acid. I suppose it is in keeping with an age of restless change and fashion : an age that seems to constantly need something new. But for those who would fain hold on to the old, well-tested practices of more than forty years ago, let me give them for their encouragement an extract from those delightfully instructive lectures—the Dr. James Watson—delivered by Sir Hector Clare Cameron at the Royal Faculty of Physicians and Surgeons, Glasgow, in February 1906, on “The Evolution of Wound Treatment during the last Forty Years” : “For the preliminary sterilising of the patient’s

skin around the seat of operation, surgeons of the present day differ greatly as to the character and complexity of the methods they employ. Lister, till he gave up operating in 1896, continued the simple procedure which he adopted thirty years before, and he informs me that he had never any reason to doubt its efficacy. This consisted in washing the surface freely with a 1 to 20 watery solution of carbolic acid, and keeping it covered with a piece of lint or other cloth soaked with the same lotion during the interval between the washing and the performance of the operation. That interval was never made by his directions a protracted one. In private practice the washing was done when he entered the patient's room, and the operation was proceeded with as soon as the instruments had been got ready and the anæsthetic administered. He never took any steps for ridding the skin of greasy impurity or epidermic *débris*. The great affinity which carbolic has for most organic substances, including the fixed oils and epidermis, made any such measures, in his opinion, wholly unnecessary. . . . The avidity with which carbolic acid seizes upon epidermic tissues was strikingly illustrated by an experiment which he related in an unpublished address to the medical students of Glasgow, delivered in 1894. Having discovered a method by which the amount of carbolic acid present in a watery solution could be determined, he packed a test-tube closely with hair of the human head and added just enough 5 per cent. solution of carbolic acid to cover it, eight times the weight of the hair being required for the purpose. Half an hour later he poured out some of the liquid and applied the test, when it was found that already nearly half the carbolic acid had been withdrawn by the hair from the watery solution. Considering the hair was only an eighth part of the weight of the solution, this was certainly very remarkable. The hair must thus have become charged with about a sixth of its weight of the antiseptic. And if a larger quantity of the lotion had been used the proportion would have been still greater. In such strength it could not fail to act powerfully as a germicide on any microbes which the hair might contain, and this applies equally to the epidermis. A knowledge of these facts, coupled with a constancy of aseptic results obtained by Lord Lister, which has probably never been

surpassed, may well make us content with his simple method of purifying the skin."

I stated above that I had largely discarded the use of tincture of iodine for the pre-operative preparation of the abdominal skin, and my reasons for doing so are the following. I had frequently noticed the irritant action which the drug seemed to have in some cases upon the surface epithelial layers, and that, now and again, this irritation extended sufficiently deeply to cause a distinct blush over the area painted; and yet, more than this, that a weeping eczematous surface might result. It was impossible not to note these facts and fail to question the influence which the drug might have upon the peritoneal surface when, by any chance, in the performance of an operation, contact between the one and the other took place.

Such contact may take place in one of two ways: either some of the iodine may be carried directly from the skin into the general peritoneal cavity, or some of the viscera may, in certain operations, lie temporarily on the surface of the skin. If, then, the contact of the iodine with the peritoneum irritates the serous membrane in the same way that it does the surface of the skin, it is not unreasonable to suppose that the result of such irritation will be the formation of adhesions within the peritoneal cavity.

It was while entertaining such questions regarding the possible deleterious effects of iodine on the peritoneum that I came across two papers in the *Zentralblatt für Chirurgie* (Nos. 19 and 26) by Propping and Bertelsmann respectively. The former proved by experiments on dogs that abundant fibrinous agglutinations resulted from the injection of a solution made up of 20 drops of tincture of iodine in 80 c.c. of salt solution into the peritoneal cavity. He further states that he had seen six cases of ileus which he believed to be attributable to adhesions the result of iodine irritation. Bertelsmann similarly recognises the possible danger connected with the use of iodine for sterilising purposes, and recommends the covering of the edges and surroundings of the wound with dry sterile gauze.

Thus, then, it cannot but be concluded that there is a certain amount of risk in the use of iodine for purposes of sterilising the skin in abdominal operations; and

valuable as it may be in effecting sterilisation, we ought to execute some precautions in preventing the contact of the peritoneal surfaces with the painted skin ; and whether this be by damp compresses wrung out of saline solution as recommended by Propping, or by sterile gauze as employed by Bertelsmann, some preventative measures should be used. For my own part, I have said I prefer, when time permits, to prepare the skin with a solution of carbolic acid, leaving the iodine treatment for certain emergency cases ; but even with these it is doubtful whether a good rub over with a 1 in 20 carbolic solution is not equally as efficient.

Such simple and common-sense precautions as the proper clothing of a patient's limbs and chest I shall not dilate upon. Suffice it to say that when so large a surface of the body is being exposed by opening the peritoneal cavity and handling the viscera, every external means should be employed to prevent the additional chilling which would necessarily follow the imperfect protection of other parts of the body.

Preparation of the Operator and his Assistants. There is no limit to the precautions which it has been deemed necessary to take in order to render both the operator and his assistants sufficiently fitted for the performance of an abdominal operation. To have a bathroom in immediate proximity to the operating-room for ablutionary purposes, clothes to cover one *cap-à-pie*, masks to breathe through, and gloves to wear, presents a picture of perfection which we may gaze upon with awe if not with admiration, but one which most surgeons will have neither the intention nor the desire to copy. However, that abdominal surgery does call, perhaps, for a little more care than might be considered necessary in other fields of operation is a sufficient justification for erring on the side of over-precaution. There is certainly no class of operations which calls for more contact of the fingers and the hands with parts of the body not naturally exposed to extraneous agencies, and equally no region more extensively subjected to the possibilities of infection than the abdominal cavity and its contained viscera. If, therefore, a surgeon considers it in the best interests of his patients to clothe himself, his assistants, and his nurses in any particular kind of protec-

tive material and of any special design, he surely has every right and reason to do so. But it does not follow that those who do not adopt such elaborate precautions are any the less careful for their results, or any the less successful in their operations. It is largely a question of being reasonable and sufficient in one's preparatory methods; and these attributes, I venture to think, are more frequently met with where there is less that savours of display. It is certainly reasonable, considering the modern way in which nurses are apt to "tousle" their hair, to see that it is completely confined beneath a cap. It is equally reasonable that all garments worn under ordinary circumstances should be replaced or covered by clean linen or cotton overalls. While I cannot see the necessity of masks for the nose and mouth of the operator and his chief assistant, I do think it is right when one or other is suffering from a nasal catarrh or "cold" to protect both his patient and others by the use of a gauze veil wrung out of carbolic lotion.

The use of rubber gloves for ordinary aseptic abdominal operations brings one on to very debatable ground. It is, however, essentially a question of individuality. If an operator considers he is himself safer to use gloves, and can by their constant employment exercise the necessary dexterity and expeditiousness, he is certainly right so far as he is personally concerned. And if, on the other hand, an operator abjures the use of gloves, it must be because, in the first place, he is satisfied he can efficiently sterilise his hands, and, in the second place, because he feels that his manipulative powers and his sense of tactile impressions are greater than when his hands are covered. As both classes claim equally good results, there is no cause for one to cast reflections or adverse criticisms on the other. But there is no question of this, that those who do wear gloves must see to it that throughout an operation they remain intact—no punctures, slits, or ruptures; and that those who do not use them, that their hands are sterile both at the beginning and throughout the operation. The acquisition of this latter requisite has proved a fertile incentive for the promulgation of many methods. One and all, however, seem to possess this common failing, that while they may show, by the most carefully carried

out bacteriological tests, that the hands are absolutely sterile immediately after their preparation, and therefore immediately before the operation, they cannot guarantee that they will remain so throughout a prolonged period of use. It is impossible to believe that any parts deeper than the surface epithelium are sterilised by the mere temporary immersion of the hands in antiseptic solutions. Therefore, when during a prolonged and fatiguing operation the hand, in common with other parts of the body, begins to perspire, surface epithelium is cast off exposing deeper cells, sweat glands exude their contents, and the sebaceous glands and hair follicles discharge material untouched by the previously applied antiseptic. Thus, there is a distinct possibility that infection may be brought about by micro-organisms hidden in those excreta which the simple surface application of an antiseptic had failed to kill, although by tests employed at the time no evidences existed of non-sterility. It was owing to the possibility of the hands proving a subsequent source of infection that led me to devise a method that I felt was as physiologically sound as it was clinically correct.

The principle underlying the method is that prolonged soaking of the hands in hot water causes active hyperæmia of the skin and subcutaneous tissues ; that this emersion soddens and facilitates the removal of dead epithelial cells, increases the secreting activity of the sudoriferous and sebaceous glands, and renders the hair follicles more accessible to the influences of carbolic acid. Practically, the process is carried out thus : While the patient is being placed under an anæsthetic, and other preparations are being made, the surgeon and his chief assistant sit with their hands soaking in hot water. After about ten minutes' immersion, and the hands are reddened from hyperæmia, each hand massages the other ; and nail-brushes are also used. All detached epithelial cells and fatty matter float to the surface of the water ; and as the tap is kept running, this allows of the top layers containing the *débris* to flow away by the waste. The hands and forearms are then well soaped, and the suds removed by fresh water running directly on the skin. When all the soap is by this means washed off, the hands are placed into a warm solution of carbolic lotion of strength 1 in 40, where they rub each

other until the patient is announced to be ready by the anæsthetist, an indication conveniently given to one and all by the striking of a small hand-bell. Suitably placed on each side of the operating-table are basins containing warm saline solution. Into these the hands are dipped immediately prior to commencing the operation, and in this solution also are the hands constantly rinsed during the operation. It is a duty of one of the nurses to see that these basins are kept supplied with clean, fresh quantities of saline. Thus, the method is an extremely simple one, and one which can be quite as efficiently carried out in the patient's house as in the hospital or the private nursing home, and by the general practitioner as by the experienced surgeon. I have adopted this method now for more than fifteen years, and my implicit belief in its efficacy for sterilising purposes often leads me to impress upon my assistants its value in the words "Soaking is better than soaping."

General Remarks upon Abdominal Operations. It is a terse and trite saying, but none the less wise and true, that "once in the abdomen get out as soon as you can." No detail has been more forcibly impressed upon me in the execution of abdominal operations, as time and experience has advanced, than that of expeditiousness. The longer the peritoneal cavity is exposed and the more the manipulation of its contents, the graver the shock produced and the greater the risks of infection. It is frequently a matter of steering between Scylla and Charybdis, for when great haste is necessary dangerous omissions are apt to occur; and it must ever be remembered that speed without caution is as bad as boldness without discretion. Bearing in mind, then, that rapidity in operating is an ideal to be constantly aimed at, one of the primary considerations regarding the actual performance of an operation will be the proper disposition of all those who take part in it. I had a photograph taken of my operating-theatre in order to show more plainly the positions of those taking part in an abdominal operation (*see* Fig. 16). The anæsthetist sits at the extreme end of the table. The operator stands on the right side of the patient, with his first assistant opposite to him and his second assistant (when such is required) on his left. The assistant in charge

of the instruments stands behind the first assistant. The nurse with the absorbent swabs and gauze pads is on the right of the operator, and the nurse with the basins for the soiled swabs and pads stands at the foot of the table. Another nurse attends to the solutions in the basins, the irrigation apparatus, and sundry other duties ; and the sister of the ward stands by, supervising the work of the nurses and giving such emergency assistance as may be required. Thus, eight (and occasionally nine) individuals are needed for the performance of an abdominal operation under ideal conditions, and to enable that expeditiousness to be secured which is so desirable.

From the first incision to the last skin stitch silence is enforced, so that the operator's requirements when uttered will at once be heard, and every one is enabled to give their undivided attention to their part in the performance. While the operator and his first assistant hold themselves responsible for the gauze swabs, the nurse who supplies these and the gauze compresses keeps count of the latter ; so that when, at the conclusion of the operation, she is asked whether the number given have all been returned, the information is forthcoming at once. The instrument assistant is responsible for the gauze plugs and a correct count of the forceps and any other instruments employed ; in addition, at the end of the operation this same assistant supplies the necessary dressings. The last duty is to see that the patient is properly protected from any possible chilling effects in being carried from the theatre to the ward.

There is one detail in the operation which is of importance, and which is carried out by operators in different ways. I allude to the material used for absorbent and protective purposes. There are those who still prefer and use sponges ; and nothing, without doubt, serves the purpose better, for there is no tissue that absorbs so well. My faith, however, was early shaken in them for, more particularly, abdominal work, from finding that it was practically impossible to effect perfect sterilisation. I tried several ways to do this, immersing sponges for various periods in different kinds of antiseptic solutions. But I invariably found that when the sponge was cut in two, and parts in the centre subjected to careful bacteriologica

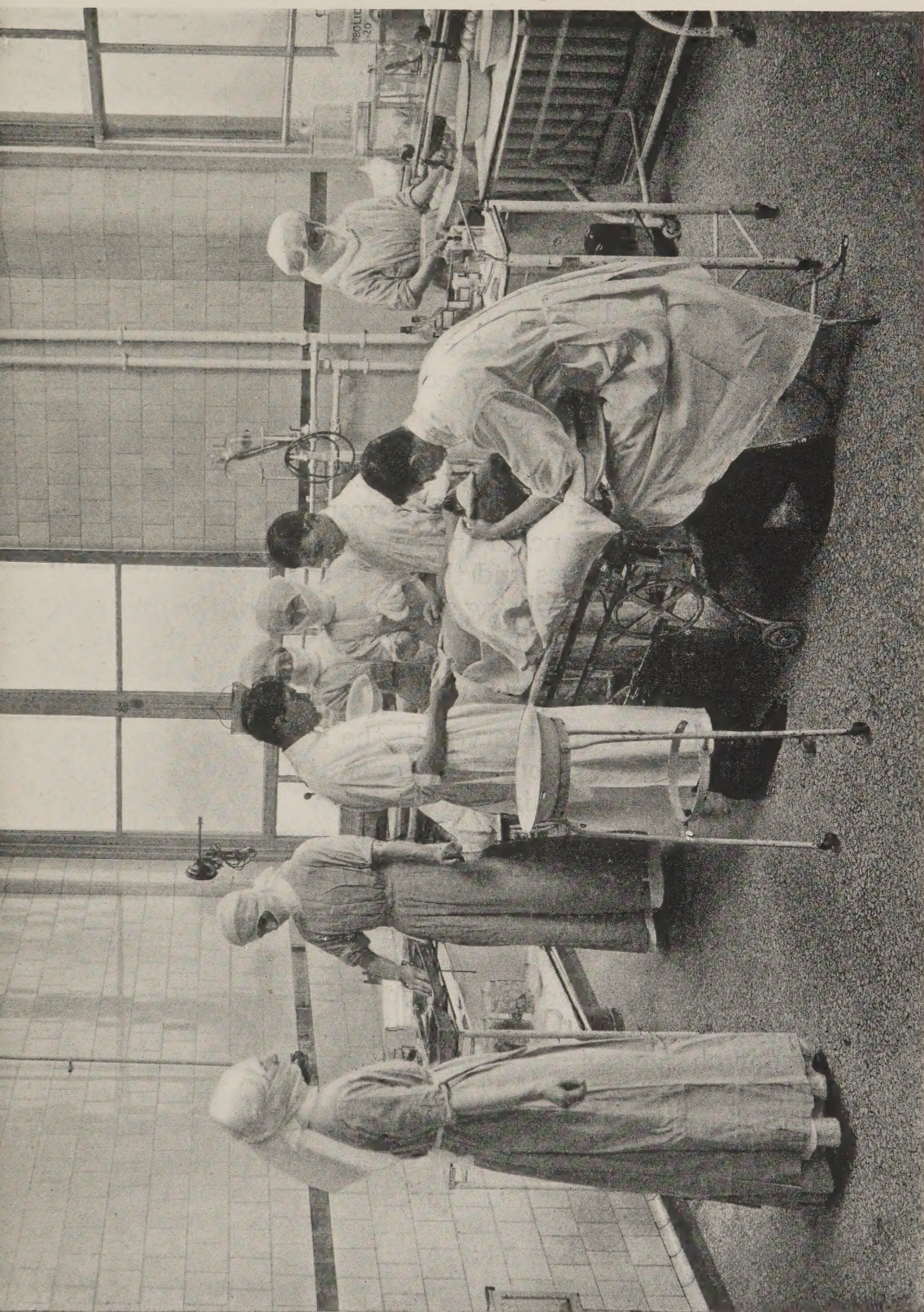


FIG. 16. Operating Theatre, to show position of those taking part in an abdominal operation.

investigation, micro-organisms were detected. The reason of this seemed to be in the modern process of preparing sponges, which, in contrast to the old slow and natural methods of removing the gelatinous matrix, was now effected artificially and so rapidly that the central part of the sponge still retained some of this glutinous material. This, then, proved a nidus for micro-organisms, and in it they could multiply and remain secure from the bactericidal action of any antiseptic. It is quite possible that as long as the sponge is not divided it may be sufficiently sterilised by prolonged immersion in carbolic lotions, and then be safe for use as an absorbent. If, by any chance, a sponge be accidentally left in the abdomen, it will become a focus of septic infection. It was the occurrence of this accident in two cases, when, some years ago, I was working specially at bacteriology, that led me to investigate the matter. The result of my researches were published in a paper in the *Annals of Surgery* (1891, vol. xiii, "On Sponges and their Use in Surgery"). Boiling, as a means of sterilising sponges, is out of the question. When the temperature has reached boiling-point the sponge begins to contract, and becomes quite useless for absorbent purposes.

As will have been observed in the account given of the performance of an abdominal operation, gauze alone is mentioned. I use it in three forms: first, as swabs of 16 ply, and 3 in. square; secondly, as compresses of 16 ply, and 10 in. by 8 in.; thirdly, as plugs of 16 ply, and 12 in. by 2 in., with a long piece of silk attached to one end. Sterilisation is effected by wrapping each separately—that is, swabs, compresses, and plugs—in a cloth, and exposing to hyperheated steam (240° F.) for twenty minutes. The compresses are sterilised in lots of thirty, so that the nurse in charge can more readily keep count of them at an operation. The item in these agents to which exception is occasionally taken is that of the swabs. It is contended that there is danger of these comparatively small pieces of tissue being forgotten, and, therefore, sometimes left in the abdomen. It is unquestionably a danger, and just because it is so is possibly the reason why one grows to be so careful that the accident never does happen. One seems to get into the habit of casting aside, almost involun-

tarily, every swab when it has served its purpose ; and when, by any chance, it is necessary to temporarily place it somewhere, a special mental note is made of the fact. The gauze plugs are usually employed for guarding the general peritoneal cavity when there is any likelihood or possibility of infection ; and as they are apt to be tucked away out of sight, long pieces of silk are attached to one end, which, remaining outside the abdomen, affords a safe indication of their existence within, and helps to render their removal easy.

That adequate assistance and efficient arrangements facilitate and expedite the execution of an abdominal operation will, I think, be frankly conceded when I give some of the shortest times in which I have been able to perform certain operations. Gastrostomies have been performed in six minutes, appendicectomies in six minutes, gastro-jejunosomy in sixteen minutes, pylorotomy in twenty-five minutes. These times are reckoned from the first cut of the knife to the tying of the last knot of the skin wound. They imply, also, that no complications existed, and, therefore, that no time was required for exploratory work or for dealing with difficulties. My aim, even in the most difficult cases, is never to exceed an hour, and often most of the time is occupied in closing the transverse incision through the abdominal parietes. When speed itself is a matter of serious consideration on account of the exceptionally weak condition of the patient, or the advanced stage of disease, the median vertical incision is used, as it can be rapidly closed by a single layer of through-and-through interrupted sutures.

A few remarks on more general considerations will complete all there is to be said regarding the conducting of the operation. The Operating Theatre or Room should be well ventilated, but anything of the nature of draughts must be carefully avoided, for it must be remembered that our completely covered bodies will fail to be sensitive to small currents of air that would seriously chill the exposed and damp surfaces of the patient's body. The temperature of the room should not be below 65° F., and it will rapidly rise from that as time goes on. No onlooker should be admitted to the operating-room if he or she has recently been in contact with septic cases, and all who do attend should be

“coated” in the same way as the assistants. By onlookers it should be understood that I mean all those who stand within a few feet of the patient. And this leads me to pass a few remarks on the presence of students in the Operating Theatre. Under all modern schemes of hospital construction, each surgeon has his own Operating Theatre or Room; it therefore no longer partakes of the character of a great amphitheatre in which all surgeons operated upon every kind of case, and into which hundreds of students indiscriminately crowded. For abdominal work, no worse conditions could well be imagined. However, in the comparatively small Operating-Room of to-day there is still the same possibility of similar ills being perpetrated, although to a much diminished extent. To reduce to a minimum some of the inevitable dangers necessarily associated with abdominal work in hospitals connected with large medical schools, only a limited number of senior students should be admitted to the operations, and these under strict regulations. No entrance or exit should be allowed during the operation. There should be no talking, and no moving from the place first taken. Abdominal operations should take precedence to all others, so that the vitiated state of the atmosphere, necessarily incumbent on the presence of a number of individuals, would be as slight as possible. The force and reasonableness of this advice is well illustrated in a simple bacteriological experiment I performed some years ago. I exposed some agar-agar plates in a theatre at the conclusion of a clinical lecture at which about a hundred students were present. The plates were incubated in the usual way, with the result that they were covered with an uncountable number of colonies of various kinds of micro-organisms. When one considers how much dirt from boots is unpreventably introduced, and how any movements tend to stir up the dust resulting therefrom, it can well be imagined how laden the atmosphere must become with particles which, whatever their nature, harmful or otherwise, can be deposited upon the open and exposed surfaces of the peritoneal cavity and its contained viscera.

General Remarks on Post-operative Treatment. One of the first considerations after an abdominal case has been removed from the operation table is to see that the

patient is placed in a well-warmed bed. This detail seems, on the face of it, too simple and commonplace to need mentioning; but the reasons are not far to see why it should be more carefully attended to in abdominal cases than in others. The operation has necessarily entailed the exposure of a considerable part of the body surface—taking into account that, for the time being, the peritoneal covering of both the abdominal parietes and the viscera constitute surfaces from which, in addition to the skin, a great deal of the natural heat of the body is lost. It is, perhaps, unnecessary to indicate that when hot-water bottles are used for heating purposes, they should be sufficiently well covered to prevent contact with naked parts of the body. Want of this simple and needful precaution on the part of an inexperienced nurse has resulted in the production of some very troublesome burns, which are very painful and very sluggish to heal.

The longer a patient sleeps after the operation the better, for this gives more time for the elimination of the anæsthetic both by way of the lungs and by other excretory organs; and the more the anæsthetic is got rid of, the less likely is the patient to vomit when he “comes to.” Until the feeling of sickness passes off, nothing should be given either by the mouth or by the rectum, for even nutrient enemata may sometimes make a patient feel sick. As soon as feeding may be attempted, and assuming the case is one in which oral feeding is not for a time forbidden, the patient’s own fancies should be humoured. Frequently his inclinations in this respect are the best criteria of what the stomach will tolerate and digest. Some patients sicken at the mere suggestion of a cup of tea, while others have a positive craving for it. And it will often be found that the gratification of this first longing or inclination will rapidly pave the way for further and stronger nourishment being administered.

In cases where oral feeding is not deemed advisable, resort must be had to nutrient enemata. I must confess that after many years’ trials of various kinds of media recommended as suitable for the purposes of rectal alimentation, my practice has been reduced to the simplest possible measures. I fully own to the comfortable sense of satisfaction which one seems to feel when a good square

peptonised meal is put into the rectum of the patient ; but one's good faith and sense of assurance soon comes to be sorely shaken when we find that it is ejected, sooner or later, in very much the same condition as when introduced, and that after a few administrations the bowel becomes so irritable that it will not tolerate the presence of the food at all. This, however, would matter but little if the temporary retention of the supposed highly nutritive enemata seemed to benefit the patient, indicating that whatever may have been returned, some nourishment had been extracted to prove generally beneficial. I could never, however, feel satisfied that this was the case ; and with the increased knowledge which we seem to have derived regarding the natural functions of the colon—that it is a simple receptacle for effete digested material, and a part of the canal from which fluids are absorbed—I have adopted the very simple medium of peptonised milk and saline solution. When these ingredients are combined in equal proportions, and raised to a temperature of 110° F., a specific gravity is obtained about the same as that of the blood ; and one, therefore, which tends to favour absorption. Certain it is, that as long as the rectum tolerates the solution, which it invariably does, little or none is returned. But the best support given in favour of so simple an enema is that most patients do quite well on it, and even in some instances positively thrive. About four ounces is administered at a time, and at intervals of three or four hours ; but this quantity can be advantageously increased to half a pint or more as soon as the smaller quantity seems to be comfortably tolerated. All administrations should be given very slowly. The rectum should be washed out every twenty-four hours with a large warm-water enema. This is best done in the morning just prior to the first nutrient for the day. It need hardly be stated that a patient, if sleeping, should not be awakened because it happens to be the time for the nutrient enema.

If vomiting occur after operation and tend to continue, the stomach should either be washed out or the patient induced to drink large draughts of hot water. One or other of these measures has sometimes an excellent effect, for it not only gives the patient something to eject, but by diluting the anæsthetic-laden mucus and gastric juices it helps

the system to rid itself more readily of the poison. Towards the same end, some give copious rectal injections of saline solution ; and others, again, transfuse the same solution directly into the venous circulation. Both measures are adopted to attain the same result—a dilution of the anæsthetic in the blood and an active secretion by the kidneys.

Pain is frequently a distressing after-symptom. It may be due directly to the effects of the operation, or, later, to colicky spasms from flatulence. It is rarely that hypodermic injections of morphia are not advisable, and should, therefore, be given in doses of one-sixth or a quarter of a grain, to be repeated if required. To deal with pain from flatulence, a rectal tube should be passed ; but if this fails in bringing about an escape of gas, the administration of a fairly copious water enema will most likely prove efficient. Some patients suffer bitterly from pain in the lumbar region due to the enforced prone position. This can sometimes be relieved by placing a small pillow beneath the back ; but nothing, as a rule, gives so much relief as turning the patient on to his side, and unless there is any very grave objection to this it should be done rather than that a night's rest should be spoilt. And this leads me to the very important consideration of rest regarded in its more general aspects. Nothing so greatly conduces to wound-repair as sleep. Nature always seems to work hardest when we are asleep, and I know of no better indication that repair is progressing satisfactorily than when a patient is able to get a certain amount of sleep on the night following the day of operation. To ensure that a patient gets the best possible chance of a quiet night, I am in the habit of having my hospital cases removed from the theatre to special rooms containing not more than three or four beds, and where special nurses are in attendance. If all goes well, and there is no particularly special treatment to be carried out, they are removed in a few days back into the ward. Here the occasional disturbances, consequent on the requirements of a general surgical ward, are no longer likely to have any detrimental effects. I may add that the class of cases particularly referred to as being best treated by temporary isolation are all those where the abdomen has had to be freely

opened for whatever cause. Cases of appendicectomy, oöphorectomy, salpingectomy, and certain simple exploratory operations can be quite well put into the general ward after removal from the Operating-Room.

There is a small detail—if, indeed, any detail in the endeavour to attain perfect results in abdominal work can be called small—which I am accustomed to have carried out, and that is—supposing all goes well—that the friends are not admitted to see the patient until the lapse of a week after operation. I find this an excellent rule to make, not only in the interest of the patient, but in that of the nursing of the case and of the friends. The various reasons for its enforcement will sufficiently suggest themselves not to need enumeration.

CHAPTER VI

PERITONEAL ADHESIONS : THEIR CAUSES, SYMPTOMS, AND TREATMENT

It is usual to consider the subject of intra-abdominal adhesions in connection with the particular viscera they involve or have been produced by ; but they are now so frequently encountered in places in which they were not expected, and are productive of symptoms often so difficult to interpret, that the subject seems one worthy of separate consideration.

The peritoneum is essentially protective in its functions, that is to say, it covers all the viscera which by reason of their necessary mobility in a sense rub against each other. The kidney, therefore, for instance, which requires to be fixed and is covered practically by immobile portions of the duodenum and colon is, although an abdominal organ, entirely uncovered ; while the small intestine which, of all the intra-abdominal viscera, needs free play for the performance of its natural functions. is, except for its narrow mesenteric border, completely surrounded. This protective function, however, of the peritoneum, to be effectually carried out, must be at the expense of a lubricating material excreted on to its free surface. Under

normal conditions this exudate is limited and free from any pathological properties ; when, however, it is altered by inflammatory processes it acts like a cementing material and tends to glue the peritoneum to any parts with which, for a sufficient time, it remains in contact.

In most places, the peritoneum is attached to the deeper structures by an intervening layer of comparatively loose cellular material, called sub-peritoneal tissue. In the mid-line in front, that is, beneath the linea alba, on the posterior layer of the rectus sheath on each side, and on the under surface of the diaphragm, this tissue is reduced to a minimum, the peritoneum being in contact with the fibrous aponeurosis on the one hand, and with muscle on the other. With the exception, therefore, of these places traction on the peritoneum will, by reason of this more or less loose underlying cellular tissue, allow of its being considerably stretched and extended. This is an anatomical feature not without its bearing on the production of adventitious bands and membranes, and on the formation of sacs into which hernial protrusions may take place.

The protective properties of the peritoneum are strikingly illustrated in certain diseases. Whether this is an intentional attribute, or whether it is purely an accidental coincidence in any particular case in which it occurs, it is not possible to say. But there is no doubt that many a lesion might prove rapidly fatal were it not that the peritoneum in the immediate neighbourhood of the disease so attaches itself to the part that further extension of the local mischief is inhibited. Over and over again one recognises this peculiar selective property of the membrane in cases of appendical abscess and perforating ulcers. It may be the visceral layer of a neighbouring coil of intestine, or the omentum which lends the needed protection and prevents the general peritoneal cavity from a fatal septic infection. That, therefore, which, in many circumstances, is the primary cause of the deleterious conditions we are now discussing, becomes, in these particular instances, a special and adequate means of saving lives.

Causes of Peritoneal Adhesions. Probably, with but few exceptions, the primary cause of peritoneal adhesions is inflammation arising either from direct or indirect

implication of the membrane. In the case of direct implication the exciting causes are: traumatism, such, for instance, as a blow on the abdomen, or friction re-



FIG. 17. Small intestine closely united together by adhesions, the result of general tuberculous peritonitis. (See "Abdominal Tuberculosis.")

sulting from the constant passage of a loop of bowel in and out of a hernial sac: the escape of septic material into the general peritoneal cavity from the patent Fallopian tubes; and infection through the blood. Indirect implication of the membrane is usually the result of one or other of various local lesions. Among the commonest

of these are : ulcers of the stomach, duodenum, and of the small and large intestine, with catarrhal inflammations of these same viscera : inflammation of the gall-bladder and gall-ducts ; appendicitis, salpingitis, and inflammation of the uterus ; and lastly, there are the post-operative adhesions, those which arise in connection with the peritoneum of the abdominal parietes and those associated with the visceral peritoneum. These various causes may have no special determining influence upon the kind of adhesions produced, although they may very materially affect the extent of parts involved.

There are the greatest possible variations in the characters of adhesions. In some cases two surfaces of separate coils of bowel may be adherent without any visible cementing tissue between them. This form is frequently met with in cases that have recovered from a general tuberculous peritonitis (*see* Fig. 17). In others, again, dependent upon the same disease, there are innumerable minute fibrous connections of different lengths passing between the intestinal coils (*see* Fig. 18). It is probable that tuberculous peritonitis is one of the commonest causes of adhesions met with in adult life ; to this must be added also tuberculous mesenteric glands. These latter are fruitful sources of bands and cords which in themselves constitute another type of adhesion of a particularly dangerous kind, inasmuch as they are apt to be the cause of intestinal obstruction.

There are adhesions which from their extent and firmness mat together parts in such a way as to cause the impression that the involved region is invaded by a tumour. This is particularly the case in adhesions associated with chronic gastric or duodenal ulcer ; and no doubt in many instances the subsequent disappearance of a supposed malignant tumour has really been nothing more than the absorption of an inflammatory mass of adhesions.

The adhesions which form in connection with recurrent attacks of appendicitis, repeated seizures of gall-stone colic, and with inflammation of the Fallopian tubes also partake of the "matting" variety. So firm and inseparable are adhesions sometimes in association with diseases of these viscera that to attempt to detach

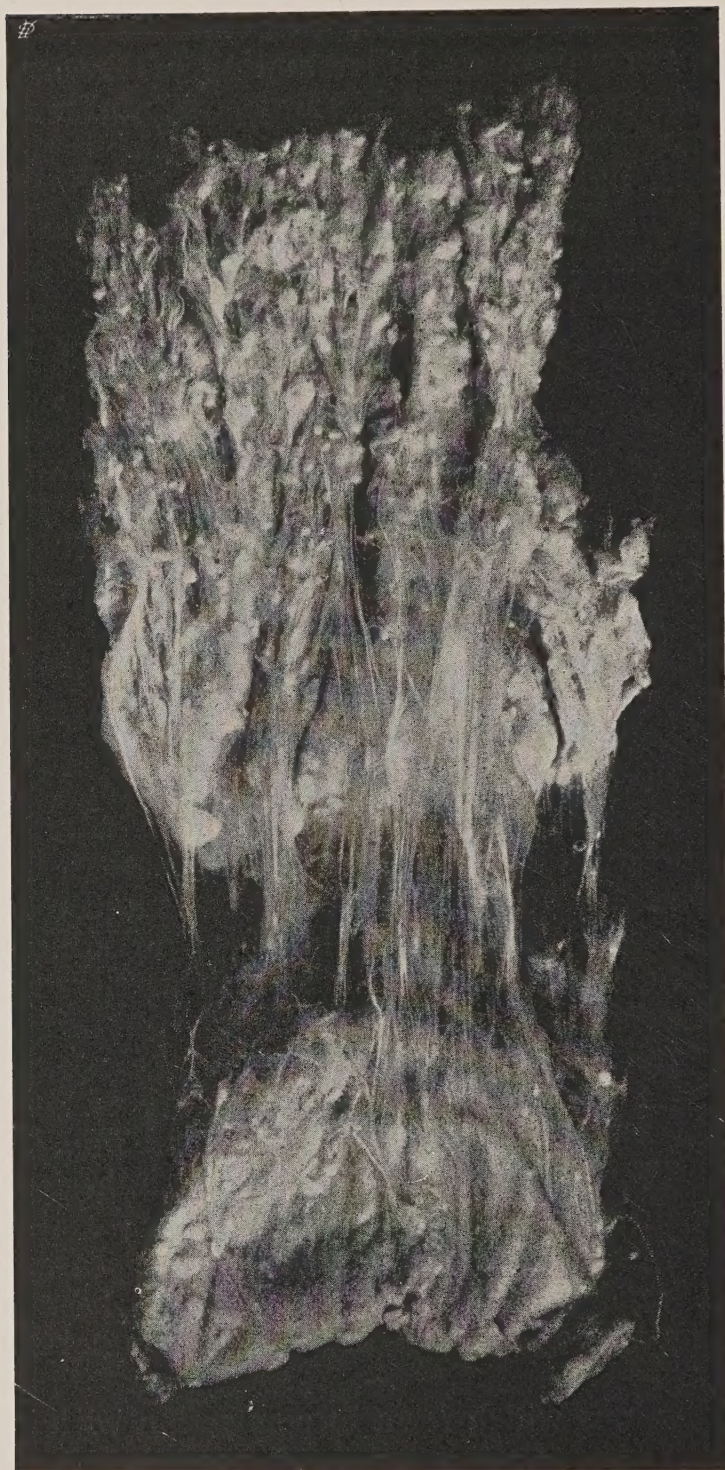


FIG. 18. Fine fibrous adhesions extending between small and large intestines, the result of general tuberculous peritonitis. (See "Abdominal Tuberculosis.")

implicated coils of intestine is to run the greater risk of tearing the gut rather than breaking through the fibrous connections.

Occasionally adhesions take the form of membranes. I have encountered some rather remarkable examples which are difficult to explain on an inflammatory basis. Indeed, they appear as if they must be congenital, and, therefore, possibly developmental in origin. In structure they differ from the common fibrous adhesions of unquestionably inflammatory origin inasmuch as they are vascular and more regular in form, almost, one might say, like a mesentery. They are mostly found in connection with some part of the colon; and uniting together different portions of the same. Fig. 19 is a drawing from a case in which the type was of that just described; the membrane was four inches broad, and connected the transverse colon with the descending colon.

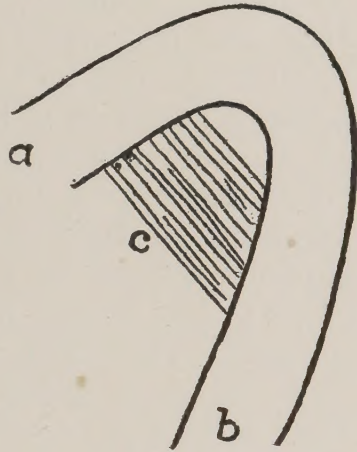


FIG. 19. Membranous adhesions, *c*, binding transverse colon, *a*, to descending colon, *b*.

There is another type of adhesion which, for want of a suitable structural name, might be called "soft"; that is to say, the parts united together can be fairly easily teased asunder without doing any damage to the viscera themselves. These adhesions are not infrequently met with obliterating the lesser cavity of the omentum; and binding loosely together the intestines in old people. In the former case we often meet with them in performing posterior gastro-jejunostomy. After teasing through the transverse meso-colon in order to reach the posterior wall of the stomach we find that there is no free peritoneal surface lining this part of the gastric parietes. It is doubtful, I think, if these soft adhesions give rise to any symptoms. Regarding their cause, they may result from temporary and mild, symptomless attacks of gastric catarrh occurring at some antecedent period of life.

Much has recently been written about adhesions resulting from chronic constipation. Whether the sequel is common in such conditions it is not possible to say. But from

the extreme frequency with which sluggishness of the bowels is met with, and the comparative rarity with which anything of the nature of trouble from adhesions occurs, one would be tempted to believe that there must be some other associated condition existing for these to be present in any particular case. There is, however, reason in the supposition; because it can be well understood how irritation of the mucous membrane of the colon by hard and retained fæces might lead to a catarrh which, by extension to the peritoneum, would cause adhesions. In further support of this opinion is the accepted fact that mucous colitis is a cause of adhesions. It was in reference to this particular question of chronic constipation being a cause of adhesions that led W. M. Mollison and H. C. Cameron to investigate the relative frequency of their existence. They examined the peritoneal cavity carefully in fifty consecutive post-mortems where the subjects varied in age from three weeks to sixty-eight years; and in all but five they found adhesions to be present. They also found that in nearly all cases the large intestine alone was involved, and that the cæcum and ascending colon were the commonest situations. As adhesions were found with such frequency in young subjects they considered it difficult to believe that they were either the cause or the consequence of chronic constipation. These investigations were published in the *Guy's Hospital Reports* (vol. lxii, 1908, p. 143).

In support of the contention, however, that chronic constipation may cause adhesions, I am inclined to think the following case, which came under my observation, may be taken as an illustration. The patient was a woman aged fifty-one years, who had for many years suffered from constipation, often going as long as a fortnight without a movement. For two months at one period of her life she had several attacks of diarrhoea lasting from one to five days; the motions at that time often contained slime. When the bowels were confined for several days, she began to suffer from a sense of distension, was conscious of movements and gurgling in her abdomen, suffered pain in the small of her back, and not unfrequently vomited. When admitted to the hospital, peristalsis was on one occasion observed in the

region of the umbilicus ; palpation of the abdomen did not cause pain, nor were any other physical signs elicited. Considering her age and the symptoms, a diagnosis of, probably, carcinoma of the colon was made. On opening the abdomen, adhesions were encountered involving the ascending colon ; they were made up principally of the omentum which passed over the bowel to be attached to the meso-colon, and not apparently to the abdominal parietes. Lower down the adhesions seemed to cover the cæcum and to embed the appendix in the wall of the latter. The ascending colon seemed to be distinctly constricted by these adhesions ; and after their division it was still impossible to straighten out the bend which the bowel seemed to have at this particular part. Any attempt to do so appeared to be prevented by the anterior longitudinal muscular band of the bowel. Nothing further was done, beyond liberating all adhesions and removing the appendix, as the bowel seemed quite freely permeable. The patient left the hospital five weeks after the operation entirely free of all her original symptoms.

But apart from this case, it is a striking fact that most of the simple colonic adhesions which I have had to deal with operatively have been connected with the ascending colon ; and this experience is in keeping with the investigation of Mollison and Cameron who, as already quoted, similarly found adhesions more frequently associated with the cæcum and ascending colon than with any other part of the large intestine. From the fact that stercoral ulcers are more often located in the cæcum, and that these are usually a sequel to a chronic obstruction in the iliac or pelvic colon, it certainly does seem as if this commencing segment of the large bowel was more susceptible to the irritative influences of fæcal retention than any other part ; and, therefore, that adhesions would be more likely to be found in consequence of such irritation.

There would seem, then, to be very reasonable grounds for supposing that chronic constipation might be one of the causes for the formation of simple peritoneal adhesions ; only, as already indicated, it is probable that a large proportion of such cases are not so followed ; and when the sequel does happen it is probably due to the accidental co-existence of exceptionally irritating materials forming

part of the retained fæces and so causing inflammation of the mucous membrane, and later of the overlying peritoneum.

Symptoms of Peritoneal Adhesions. The symptoms are largely determined, in the first place, by the viscera or parts with which the adhesions are connected. Thus, those the result of chronic ulcer of the stomach or duodenum mostly manifest gastric disturbances, equally those due to gall-stones, cholecystitis, or cholangitis may present similar manifestations. When arising from inflammatory affections of the intestines and the appendix, bowel troubles, of some kind, result. And when the adhesions owe their origin to inflammations connected with the female pelvic viscera, symptoms of various kinds are evoked suggestive of mischief in the lower abdominal region.

The one common symptom, however, of all adhesions is pain; and it is usually the intractable nature of this pain, and its frequent want of definiteness, that invariably brings these patients under the observation of the surgeon.

When the pain is due to adhesions the result of disease either of the stomach, duodenum, gall-bladder, or bile-ducts, its locality and its possible association with other symptoms connected with these viscera suggests, at least, the particular region where the mischief is, but unfortunately by no means definitely indicates its real nature. At the most, we can usually only surmise that, from the history of the possible existence at some antecedent period of lesions such as gall-stones, ulceration, &c., adhesions may be at the base of the patient's sufferings. Frequently adhesions, as a result of gastric or duodenal ulcer, cause obstructive symptoms; and nothing enables us to differentiate between a narrowed pyloric aperture the result of a cicatrised ulcer, and a simple kinking of the canal by adhesions, except an exploratory operation. So, again, when pain is due to adhesions the result of disease of the appendix and pelvic viscera, the locality of the pain and the possible coexistence of other symptoms connected with the particular disease will suggest the region involved; but here, just as in the case of the viscera of the upper abdomen, it will not be, probably, until

the peritoneal cavity is opened that a diagnosis will be rendered possible.

The physical signs connected with peritoneal adhesions are very variable. Sometimes palpation, with more or less deep pressure, may elicit tenderness and even pain, but, as often as not, no inconvenience is experienced. The evocation of pain probably depends a good deal on the points of attachment of the adhesions, that is to say, when they are united to such sensitive parts as the parietal peritoneum, tenderness and even pain may be caused by attempting to manipulate the part.

Vague as are the symptoms exclusively indicative of the presence of adhesions in the upper and lower abdomen, they are even more obscure when causing trouble in the mid abdomen. Indeed, when a diagnosis is made it is more often by the method of exclusion than by any direct and positive evidence suggestive that the symptoms are dependent upon such a cause. I think I should be correct in saying that the discovery of adhesions as the source of any particular condition is more frequently an unexpected one than otherwise. If, as is usually the case, the effect of adhesions among the coils of intestines is to cause symptoms of obstruction, chronic or acute, it is rarely that carcinoma or tubercular stricture is not first entertained, according, more or less, to the age of the patient.

Apart, however, from any obstructive effects of adhesions, their production of pain creates a class of cases most puzzling sometimes to distinguish and explain. Take, for instance, cases where the adhesions involve some part of the colon; they are not of the type to produce obstruction, but they evoke pains intermittent in character and very variable in intensity. It seems almost as if the adhesions by dragging on the bowel excited it to over-contraction and so induced pains of a colicky or neuralgic type. These pains may occur at any time, and not infrequently at night, so that a patient's rest is often greatly disturbed.

When adhesions take place between the viscera and some part of the abdominal parietes pain may be evoked by ordinary physical movements, such as stooping, stretching, or hyper-extension of the trunk. I have known move-

ments of the leg cause pain in cases of adhesions binding the cæcum and ascending colon to the psoas muscle.

The great sensitiveness of the parietal peritoneum accounts for some of the most distressing cases we encounter; and unfortunately they are not infrequently post-operative in origin. One of the worst cases of the kind that I can recall was that of a woman who had been operated upon for some gastric disturbance the nature of which was not ascertained. When sent to me, she was a constant sufferer of abdominal pain, and occasionally had symptoms suggestive of slight intestinal obstruction. The pain at an earlier stage of her trouble was only occasional, but latterly had become so continuous that frequently her nights were disturbed by it. I opened the abdomen below the old scar which was situated in the middle line above the umbilicus. Dense adhesions were at once encountered passing between the old wound and the colon and omentum beneath. The adhesions also extended for some distance around and beyond the scar, which seemed to suggest that there must have been an area of localised peritonitis. The adhesions were severed as far as possible, but not all could be dealt with. Further, I tried to displace the colon and omentum by drawing down and fixing the latter to the iliac region, my object being to so alter the relation of the previously attached parts that reunion should not occur in the original places. She was better for a time; but re-attachment soon occurred with a repetition of all the old pains and symptoms. She lingered on for some time a great sufferer, and becoming gradually weaker died from sheer exhaustion.

I have met with many cases much worse so far as the degree and distribution of adhesions are concerned, but none where the pain was more severe; and the reason of this is solely to be attributed to the extensive involvement of the sensitive peritoneum underlying the anterior abdominal parietes.

It is sometimes found that the pain, as might be expected, is much less when the patient is in the recumbent position, for the probable reason that the relation of the parts to the adhesions becomes such that the latter no longer exercise their dragging or constricting effects.

The result of this improvement is such sometimes that the patient may remain well for a time, and so delude both himself and his medical attendant into the belief that a cure has been effected. After, however, variable intervals of time, another attack arises to be again relieved by the same treatment of rest. This see-saw sequence of health and suffering, without any other marked symptoms, may often be taken as a very fair indication that probably or possibly peritoneal adhesions are at the base of the patient's trouble. In illustration of a case

manifesting symptoms of the nature of those just described, I may narrate the following which I operated upon some years ago. The patient was a woman aged forty-three years. About thirteen years prior to the time I first saw her, she was seized with pain in the right iliac fossa accompanied with vomiting; since that initial seizure she had had ten or eleven similar attacks; the vomiting would pass off in a few days, but the pain and discomfort would linger sometimes for weeks. These attacks were unaccompanied with any

rise of temperature, and there was very slight or practically no tenderness of the part. She had been always constipated, requiring to take aperients; and this condition was more marked at the time of her painful attacks. She complained that, sometimes when walking or in moving her right leg, pain was felt in the right iliac region. The abdomen was opened as for an appendix operation. The appendix, however, appeared perfectly healthy, as did also the uterus and adnexa. On further searching for a cause some adhesions were encountered about the middle of the ascending colon which doubled the bowel on itself (*see* Fig. 20), and attached it so deeply that it could not be brought out like the cæcum below and the part of the colon above. On examining more closely, a small knotty structure existed in the middle of the adhesion which bound the limbs of the colon together. The colon itself in the

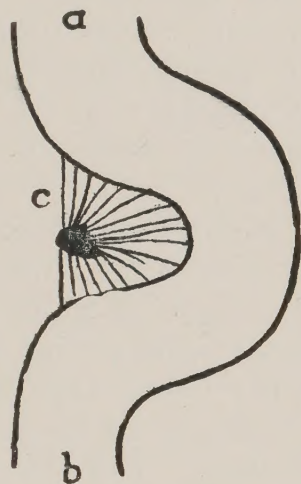


FIG. 20. Adhesions, *c*, binding together two limbs, *a* and *b*, of the ascending colon.

neighbourhood of the adhesions presented no indication of constriction, ulcer, or growth, the passage from below upwards appearing perfectly free. The adhesions were divided, and an endeavour made to straighten out the gut ; but it was soon seen that this was prevented by the anterior longitudinal muscular band which stood up like a tense cord. As there seemed some difficulty about liberating the bowel from its deep attachments, it was left undisturbed, and short-circuiting performed by creating a fistula bimucosa between the two limbs of the colon, thus establishing a straight tract between the cæcum and the upper portion of the ascending colon. She made an uninterrupted recovery, and was relieved of all her symptoms. A microscopical examination of the knotty piece of tissue showed it to consist of a small collection of fat.

Before concluding these remarks on the symptoms of peritoneal adhesions it should be noted that some of the most puzzling cases with which we have to deal are those where the associated symptoms are reflected to other parts, and become so prominent there as to divert attention away from the seat of the real source of the trouble. The symptoms in these cases are most marked, if, indeed, they do not only appear, when the adhesions tend to cause obstruction. It is known, for instance, how frequently patients suffering from carcinoma of the colon complain of what they call bilious attacks, that is to say, they lose a relish for food, are inclined to vomit, suffer from headache, are constipated, and, in general, feel "out of sorts." Some of these patients with adhesions, mostly connected with the colon, present very similar symptoms ; and unless the case is very closely investigated and observed it is probable that the patient will be treated for a supposed gastric derangement. Striking illustrations of such sequences of symptoms as above indicated are afforded by the following two cases which came under my observation. The first was a woman aged fifty-three years. About six months prior to her admission to the hospital she commenced to have pain in both lumbar regions. This pain only lasted a day or two, and on its disappearance she began to feel marked discomfort in the epigastrium after food, coupled

with sour eructations and great flatulence. She had never actually vomited, and her bowels had not been markedly constipated. Her chief complaint seemed to be, as she expressed it, "great palpitation of stomach and bowels," which would occur at variable intervals of time, coupled with this excessive flatulence. Physical examination was negative, with the exception that pressure to the right and below the umbilicus produced slight pain. She had been living on a very light diet; but when put to bed and given a full diet no discomfort ensued. As it was thought that the appendix was likely at fault, the abdomen was opened in the right iliac fossa. Several adhesions were found uniting together successive segments of the ascending colon, and so causing some kinking of the bowel. When these were divided it was found possible to straighten out the intestine. The appendix was quite free and apparently normal. She made an uninterrupted recovery, and left the hospital five weeks after her operation, perfectly well and entirely free of her original symptoms.

The second case is even more striking in the prominence of the gastric symptoms. The case was that of a woman aged fifty-one years who, eighteen months prior to admission to hospital, commenced to be troubled with stomach symptoms. She stated that her food did not agree with her, often made her feel sick, and often produced a dull pain in the epigastric region. From the time of the initial symptoms onwards, gastric troubles had been of an intermittent character, there being times when she was free of any discomfort. Her present attack commenced three weeks ago, and was characterised by a feeling of weight and discomfort in the epigastrium after meals accompanied with acid eructations, flatulence, and sometimes vomiting. The vomiting occurred usually at night, was not large in quantity, and consisted of fluid and partly digested food. Even after she had apparently emptied her stomach she had a feeling as if something was still lying there. Her bowels were constipated. With light diet and rest in bed much of her discomfort disappeared. Physical signs were practically negative, except that pressure in the epigastrium and in the gall-bladder region evinced slight tenderness. No evidences were obtained, by lavage and gastric distension, of any

pyloric obstruction. When the peritoneal cavity was opened all the parts in the upper abdomen were found normal; and it was only on exploring the lower part of the cavity that adhesions were found around the cæcum. The appendix was quite healthy. Among the adhesions a nodular mass was felt which, on removal, proved to be a concretion, the result, probably, of an old tuberculous focus. The cæcum was freed of its adhesions. The patient made an uninterrupted recovery, and was dismissed five weeks after operation in excellent health, and taking all kinds of food without any complaint.

It is a striking fact that so far as my own cases are concerned they have been nearly all women, and between forty-five and fifty-five years of age. Whether the more sedentary life of women, or rather their less physical activity as compared with men, together also with their undoubted greater tendency to constipation, are conditions to be taken as predisposing to the formation of simple colonic adhesions, it is perhaps not possible to say. But it would almost seem as if it must be so in order to account for their greater frequency in the one sex than in the other.

A valuable contribution on colonic adhesions appeared in the January number of the *Annals of Surgery* for 1912 by Lewis S. Pilcher, under the title of "Surgical Aspects of Membranous Pericolicitis." The paper deals more particularly with adhesions about the region of the lower ileum, cæcum, appendix, and ascending colon; and indicates very clearly how the hampering effect of these membranous attachments may so interfere with the normal functions of the part as to produce symptoms of partial obstruction and its sequelæ of pain and auto-intoxication. The article is most instructively illustrated, and shows to what advantage "bismuth meals" and X-ray photography may be put in outlining the malpositions of the colon consequent on the formation of fibrous bands and membranes.

Treatment of Peritoneal Adhesions. The treatment of peritoneal adhesions affords extreme examples of success and failure. The simple division of a band causing distinct symptoms of intestinal obstruction may result in a life-long recovery; while the separation of multiple

adhesions may only end in temporary improvement, and defy sometimes every effort to prevent a fatal issue.

There are two points worthy of preliminary consideration before proceeding to the subject of true treatment. One concerns the possible absorption of adhesions; and the other, their prevention. That some adhesions may become ultimately absorbed, at least in the pelvic cavity, there is no doubt. I have had the opportunity myself of noting this in a case where two consecutive operations were performed at an interval of time. At the first operation several adhesions were found in the pelvis; while at the second operation they seemed to have almost disappeared. And this is, I believe, no uncommon experience with those whose sphere of work is largely purely gynæcological. Adhesions arising from a pelvic cellulitis are probably among those which most frequently considerably disappear in time. Whether adhesions in other parts of the abdominal cavity may equally disappear I have had no opportunity of judging, except that on a few occasions, when I have had to reopen the abdomen some two or three years after a gastro-jejunostomy, the adhesions following the original operation have still been present; and by adhesions I mean, not those directly connected with the anastomosis itself, but adventitious ones formed in the neighbourhood of the seat of operation and indirectly the result of it. It is quite possible, however, that adhesions may, and do to a certain extent, disappear; for Nature always tends to restore parts to their normal condition. The requirement most needed for their absorption is, probably, a sufficient blood-supply; for this reason, therefore, short and dense adhesions which may further become vascularised are those most likely to be absorbed if they do not become further organised.

The question of prevention primarily touches the various causes which give rise to adhesions. Thus, if chronic constipation is to be considered one of these, then every effort must be made to prevent its prolonged continuance; by what means, whether by medicine or by operation, there is no need to discuss here.

Operating at early periods in such diseases as appendicitis and cholecystitis will unquestionably prove a preventive measure; for it is invariably repeated

attacks of one or other of these conditions, and the more advanced stages of each, that are the commonest causes of adhesions in these regions.

Operations within the peritoneal cavity should of themselves always be conducted with a view to the possible avoidance of adhesions. Whenever a raw surface is left there is the likelihood of a coil of intestine, the mesentery, or the omentum becoming adherent. For this reason, therefore, every effort should be made to bring together divided peritoneal margins so that an unbroken continuity of the serous surface is effected. Thus, in removal of any of the female pelvic viscera, the stumps or pedicles left behind should, if possible, be embedded and covered by suturing the peritoneum over them. Neglect of this precaution is a common source of many serious troubles, the result of adhesions contracted between the granulating surfaces and neighbouring viscera.

Equally, it must be remembered that in all abdominal operations, undue friction exercised upon the peritoneal surfaces, be they visceral or parietal, together with prolonged exposure, are conditions liable to produce a localised peritonitis resulting in adventitious attachments. When, by any chance, the peritoneum lining the intestines becomes, in the course of an operation, abraded, torn, or in any way damaged, it should be carefully and accurately sutured, and in this way completely closed. The precaution is not only a wise one from the point of view of preventing subsequent adhesions, but for the even more cogent reason of protection against infection from the contents of the bowel. The peritoneum is the great barrier to the passage of septic organisms from the intestinal canal into the peritoneal cavity; and if this barrier is removed there is nothing to hinder the transit of the bacilli coli communis, streptococci, staphylococci, and any other pathogenic micro-organisms that may chance to be present in the immediate vicinity of the lesions. Many fatal cases of post-operative peritonitis have probably resulted for want of taking this simple precaution of dealing with small lesions of the visceral peritoneal surface.

There is one cause, only too apt to be overlooked, perhaps more by the patient than the practitioner, and that is a

vaginal discharge. These discharges, always more or less septic in character, are fruitful causes of salpingitis, endometritis, and metritis ; and when inflammation attacks these viscera, pelvic adhesions are almost an inevitable result. As a preventive measure, therefore, all such discharges should be carefully treated with a view to their being cured as soon as possible.

The only radical treatment of peritoneal adhesions is by operation ; it is not, however, too much to assume that, when we have good reason to believe they are the direct cause of the patient's sufferings and are not a menace to life, some good may result from a preliminary trial of more or less free and continuous purgation, and of vigorous massage of the deeper parts of the abdomen. Such treatment would be based on the principle of increasing the vascularity of the parts so as to aid absorption ; for, as already indicated, it is probable that the natural removal of adhesions can only be effected in those parts where there is a free blood-supply. These remarks, of course, only apply to intestinal adhesions.

The success of surgical treatment largely depends upon the character of the adhesions to be dealt with. With cords, bands, and, in general, any adhesions which are of a ligamentous nature, division is only required. The real difficulty lies with adhesions that mat parts so closely together that they cannot be simply divided, but, instead, need a great deal of comparatively rough manipulation to effect a severance. It is the treatment of these particularly dense and intimately adherent adhesions that renders it so difficult sometimes to know how far one should extend one's efforts. It means, in the first place, that our attempts may end in laceration of the viscera to which the adhesions are attached ; for the firmness and toughness of these latter may be such as to render them less likely to give than the more delicate normal tissues with which they are united.

As illustrating somewhat the difficulties here referred to, and the dangers connected with attempts to deal radically with them, I will narrate the following case which is one of the worst, I think, I have, wisely or unwisely, forced my way through. "All's well that ends well" may be a very good proverb for many attempts

made in different departments of life ; but I do not think it is one that can be considered altogether quite suitable for a surgeon's sphere of labour ; for it is very questionable whether the grave risks run to obtain such a result, as good fortune favoured me with in this case, were entirely justifiable. The chances are that a similar effort in another case would prove fatal, and what then would be the verdict? —that we should not have attempted so much. It is in these cases of multiple adhesions, mostly the result of an old tuberculous peritonitis, that it always seems to me that more knowledge is required to know when we should desist from making further attempts than when to do more. It is somewhat of an enigmatical position and, perhaps, puzzlingly expressed, but I think it will be understood what I mean.

This is the case I wish to narrate. A young man, aged twenty-one years, was admitted to the Victoria Infirmary in June 1904. His statement was that twelve years ago he had inflammation of the bowels with tenderness and rigidity of the lower part of the abdomen. He was ill for about six months at this time, and seemed to make a good recovery. But about six months later he had a similar attack lasting about the same period. From this attack he seems to have made quite a good recovery. For the last six or seven years he had suffered from what he considered indigestion, and only been able to keep himself fairly well by strict attention to diet and by careful regulation of his bowels.

The illness, however, for which he presented himself, dated back to about a year previous, when he was seized somewhat suddenly with severe pain in the abdomen, a little below and to the left of the umbilicus. It lasted, off and on, for the whole night, and caused him to vomit. This attack lasted for four days, when he felt fairly well again. A second attack of abdominal pain, however, seized him about a fortnight later. The onset was more gradual and unaccompanied by vomiting, but the bowels were constipated and required an aperient to move them. From this he recovered only to be again seized with a third attack, similar in all respects to the second, and lasting three weeks. From this period onward he appeared to have been free from any apparently acute

seizures, but he had gradually lost flesh and strength : had increasing difficulty in the moving of his bowels ; and had mild attacks of pain, principally in the left iliac region. He had further noticed that flatus would sometimes collect in this region. It caused pain which was immediately relieved on its passage *per anum*.

On admission he was observed to be pale and emaciated. His tongue was moist and fairly clean. His appetite fair ; his bowels costive. The abdomen was found to be distended all over, but neither rigid, nor tender. On watching the abdomen, waves of peristalsis were seen. These originated in the middle line just below the umbilicus, and travelled down to near the pubis ; they then turned to the left and rapidly increased in size. In about a second or two a gurgling noise was heard, and the wave disappeared to reappear a few inches further on, and finally to disappear in the left iliac fossa. Nothing could be elicited by palpation. The lungs were normal.

The abdomen was opened by a transverse incision two inches below the umbilicus, and was about three inches in length. The small intestines were all so intimately matted together that no free coils could be found. There were three places where the matting was extremely dense and tough. One was situated to the left, and involved the colon ; another was more centrally placed ; and the third, the worst of all, was in the cæcal region. The adhesions were mostly membranous between the coils ; and these were torn and cut through, not, however, without difficulty. But at the three places above indicated the connections were so intimate that in separating them the bowel was opened in about half a dozen places. Where the openings were small the apertures were tucked in and secured by a purse-string suture ; but where they were large, and fæcal matter escaped, closure was effected by a double line of sutures. Much matting was left untouched ; but all apparently of the membranous kind. The abdomen was completely closed. The operation lasted two hours. All went well for a few days, then an abscess formed in the middle of the parietal wound ; this burst and was followed by a discharge of fæces. The opening became so large that finally all the fæces were discharged on to the surface of the abdomen. Matters,

for a time, looked almost hopeless. However, in the course of a few weeks the wound commenced to clean up; the fæces to lessen in amount by the wound and to come more by the anus; and at last the wound completely healed. The patient was heard of two years after, when the report was that he was free from all abdominal troubles, neither discomforted by pain nor in defæcation.

In dealing with extensively distributed adhesions, causing symptoms of intermittent obstruction, such, for instance, as were encountered in the above case, I believe the most correct course to pursue is only to sever such attachments as can be easily dealt with; and, then, if this does not seem sufficient to be likely to relieve the obstruction, to short-circuit between a distended loop and a collapsed portion of bowel. This I have done with complete success; although in one case, from want of knowledge regarding the segments so connected, it was not until the bowels moved that I was able to learn where the anastomosis had probably been made. For it can be well understood that should the fistula bimucosa have been established between a loop of jejunum high up and a loop of ileum low down, the stools would be lenteric, and death from physiological starvation sooner or later result.

The greatest difficulty we have to contend with, in the separation of parts closely joined together by adhesions, is to prevent reattachment. If the separation leaves practically raw surfaces, a reunion of detached parts is almost certain to take place; and whatever the symptoms before operation, they will sooner or later reappear. We may try, as I have already described in one case, to draw the detached parts away from each other; but, even then, if raw surfaces are still left, union will simply take place with such other parts as may come in contact with these abraded surfaces.

All kinds of mechanical means have been employed to try and prevent separated parts from reuniting, but only with very questionable success. More hope, however, may be looked for in the use of oil. It has been proposed to smear over the raw surfaces some kind of sterilised oil; and, for this purpose, D. P. D. Wilkie has suggested sterile vaseline oil. This medium is described by Wilkie

as the oily liquid which comes to the surface in the preparation of vaseline; it is really a liquid paraffine, is absolutely neutral, and remains unchanged after prolonged exposure to steam under high pressure. I can speak from no experience of its use; but considering how hopeless all mechanical procedures often are, and how grave the outlook in many of these patients, I should be tempted to try it in any suitable case. For further information on this method of treatment, I would refer the reader to Wilkie's paper in *Surgery, Gynæcology, and Obstetrics* (February 1910, pp. 126-132) on "The Use of Oil in Abdominal Surgery"; and to a still more recent exhaustive discussion on the whole subject by Edward H. Richardson of Baltimore (*Annals of Surgery*, December 1911). This latter writer advocates as the most reliable measures the use of "viable grafts of omentum or peritoneum."

CHAPTER VII

ŒSOPHAGEAL OBSTRUCTION AND ITS TREATMENT BY GASTROSTOMY

I HAVE no intention in this chapter of dealing with the various causes of œsophageal obstruction, nor of referring to any of the symptoms other than those which concern the reasons for operation. Neither is it my object to enumerate or describe the different methods employed for dealing with the obstruction by way of the gullet itself. What I have in view are answers to the questions (1) Whether and when it is advisable to open the stomach? and (2) What is the best operation to adopt to do so?

To answer the first question, which is in reality a double one, almost necessitates that we should, *imprimis*, state the advantages that the operation holds out; for unless it can be shown that the results of the operation do not carry with them the introduction of other inconveniences almost greater than those for which the operation is executed, it need hardly be said that there is little to commend the treatment. To enable me, however, to discuss the subject in the order proposed, I shall briefly

dismiss the argument by saying that the operation can be performed without either immediate or after ill effects. Thus, then, we may reply to the first query, whether it is wise to operate, by saying that, unless the patient is practically moribund from starvation, or that there be evidences of advanced disease of the stomach or gullet, or indications that the liver is grossly invaded, there is no objection, so far as the performance of the operation is concerned, in advising its execution. I must, however, qualify this opinion by saying that it is based on the understanding that the operation performed is the Kader-Senn, which, as I shall later describe, can be executed with such rapidity and with so little disturbance to the patient that it may be performed on many an advanced case which it would be unwise to submit to some of the other more lengthy procedures.

The second query of the first question—When should the operation be performed?—involves several important considerations. Based, I believe, on the supposed dangers of the operation and the occasional inconveniences which follow it, many surgeons have been induced to postpone gastrostomy until the patient is almost at the stage of being unable to swallow liquids. This, of course, means that by this time the patient has become greatly reduced in strength and so weakened that the performance of an operation is accompanied with considerably increased risk. If, however, it can be shown that neither risk nor inconvenience need follow the operation, there can be no possible objection to its performance at a much earlier period of the obstructive symptoms. The one condition necessary is the consent of the patient, based on a full understanding what the operation implies and what relief it is likely to afford. It is quite possible that some sensitive patients, knowing their hopeless condition, would prefer to die from the process of slow starvation, which may with them have already advanced to a considerable extent, than have their life prolonged by the adoption of a measure which would in itself be distasteful to them. Under such circumstances, it need hardly be said, the surgeon has no possible ground to go upon to persuade his patient to submit to an operation that can only be offered as a temporary means of relief with no prospect of a permanent

cure. In these remarks I, of course, only refer to cases of carcinomatous obstruction. It would be quite different in the case of cicatricial stenosis, where the operation is performed, not only as a means of administering nourishment, but quite probably as part of the method to be employed in treating the stricture. Indeed, it may be taken that all my remarks have reference to cases of carcinoma of the gullet, for these cases far and away outclass all others in their relative frequency of occurrence.

To revert to my query, I am disposed to advise gastrotomy when the patient commences to fail to get down any solid food ; or, to express it in another way, when he finds that only fluids can be got into the stomach. At this juncture the patient's strength may not have been much reduced, and the amount of nourishment which the operation will admit of being introduced into the system will tend to prolong this period of physical fitness. I am assuming that there are no other symptoms than those directly connected with the obstruction. When, however, pain accompanies every act of deglutition ; when, from the position of the growth, the recurrent laryngeal nerve is involved so that normal respiration is interfered with ; and when, still further, invasion of the upper part of the larynx causes distress both in swallowing and breathing, then relief can only be afforded by gastrotomy.

It is interesting to consider the ways in which gastrotomy affords relief ; but to properly appreciate their value one must understand how the patient's sufferings are produced. In the case of disease high up in the gullet it is often not so much obstruction as irritation that causes the real trouble. The patient may have a cough as the direct result of the invasion, which may be considerably increased by the passage of food down the gullet ; or it may be that some of the fluid swallowed trickles over into the larynx and evokes a violent fit of coughing or choking. It naturally follows in these cases that if nourishment can be administered by another route than by the mouth much relief must necessarily be afforded. When the obstruction is lower down, it is not merely the inconvenience associated with the ejection of food at variable intervals after being taken, but the pain which results from the effort of the gullet to propel its contents through the

narrowed channel. This narrowing is dependent not only on the organic lesion itself, but on the spasm and inflammatory œdema consequent upon the irritation induced by the detained ingesta. These latter causes have often more to do with the pain and obstruction than the primary lesion, and it is just these that the operation of gastrostomy tends so largely to minimise the effects of. Constantly will it be observed that after the patient has been fed for a few days by the artificial orifice, swallowing will so much have improved that he will take food with a freedom and absence of pain that for some time antecedent has not been possible. This improvement in itself more than compensates for any physical discomfort during the period necessarily required for the gastrostomy fistula to become an efficient channel for feeding purposes.

This leads me to say a few words about what is frequently described as one of the chief drawbacks to the operation—the escape of the gastric secretion through the wound, and the consequent irritation of the surrounding skin. That this, when it occurs, may prove a most irritating and even distressing condition, there is no question; and it was a sequel of by no means uncommon occurrence in the earlier methods of making a gastric mouth. The skin around the artificial opening would redden, then lose its superficial epithelium in places, and, lastly, present a raw surface which, if not actually pain-producing, would cause a burning and smarting sensation more or less constant, and always increased by anything that caused friction or chemical irritation. To prevent, therefore, this condition of the skin happening, various operative procedures were devised with the object of checking any outflow of the acid gastric juice. Among these may be mentioned Hahn's, Witzel's, and Frank's. I have described these operations along with others in full elsewhere (*see* "The Surgery of the Alimentary Canal," p. 241), and do not intend to introduce them here. I may, however, add that, of these three, I believe Frank's method is the one most commonly employed.

The method which I have now for many years adopted is practically a modification of Frank's. It was described first by Kader of Breslau; and, almost at the same time, but quite independently, by Senn of Chicago (1896). I

have always designated the operation, therefore, the Kader-Senn. The essential difference between this operation and Frank's is that in the former the cone of stomach drawn through the abdominal incision is secured in such a way as to form a valve which permits of the easy passage inwards of food but inhibits the escape externally of the gastric contents. In Frank's operation this latter function is carried out by a band or collar of skin and subcutaneous tissue, formed by a second incision running parallel to the first, beneath which the gastric cone is drawn and secured.

Kader-Senn Operation. This operation is performed in the following way: An incision about three inches in length starts just below the left costal arch and courses down the left semilunar line. It is deepened obliquely both above and below, so that the actual opening into the peritoneal cavity is not more than about half the length of the skin incision. There are usually no vessels to tie. The edges of the wound are retracted, and the stomach is then generally seen lying well up under the ribs. It is seized with a pair of artery forceps, and pulled out of the abdomen until a cone of sufficient size is withdrawn. As a rule, from the contracted state of the stomach, this generally means as much as it is possible to pull out (*see* Fig. 21). While this is held by an assistant, four silk-worm-gut sutures are inserted at points equidistant from each other; these sutures pass completely through the abdominal parietes and through the sero-muscular wall of the stomach, so that when tied they fix the visceral layer of the peritoneum to the parietal, and, in addition, help to close the wound.

A straight needle, threaded with chromic gut, is passed in and out through the sero-muscular coat of the stomach at the base of the cone, forming thereby a purse-string suture. The apex of the cone, now held by two pairs of artery forceps about half an inch apart, is opened, and the special glass gastrostomy tube introduced sufficiently far to allow of its being transfixed by a needle threaded with gut which, when tied, secures the one to the other. (This tube has two small holes in it opposite to each other about one centimetre from its end, to admit of this attachment of the tube to the stomach.) The tube is then pushed into

the abdominal cavity, that is, into the stomach, carrying with it the apex of the cone; and when so invaginated the purse-string suture is drawn taut. One or two silkworm-gut stitches are inserted through the parietal wound above

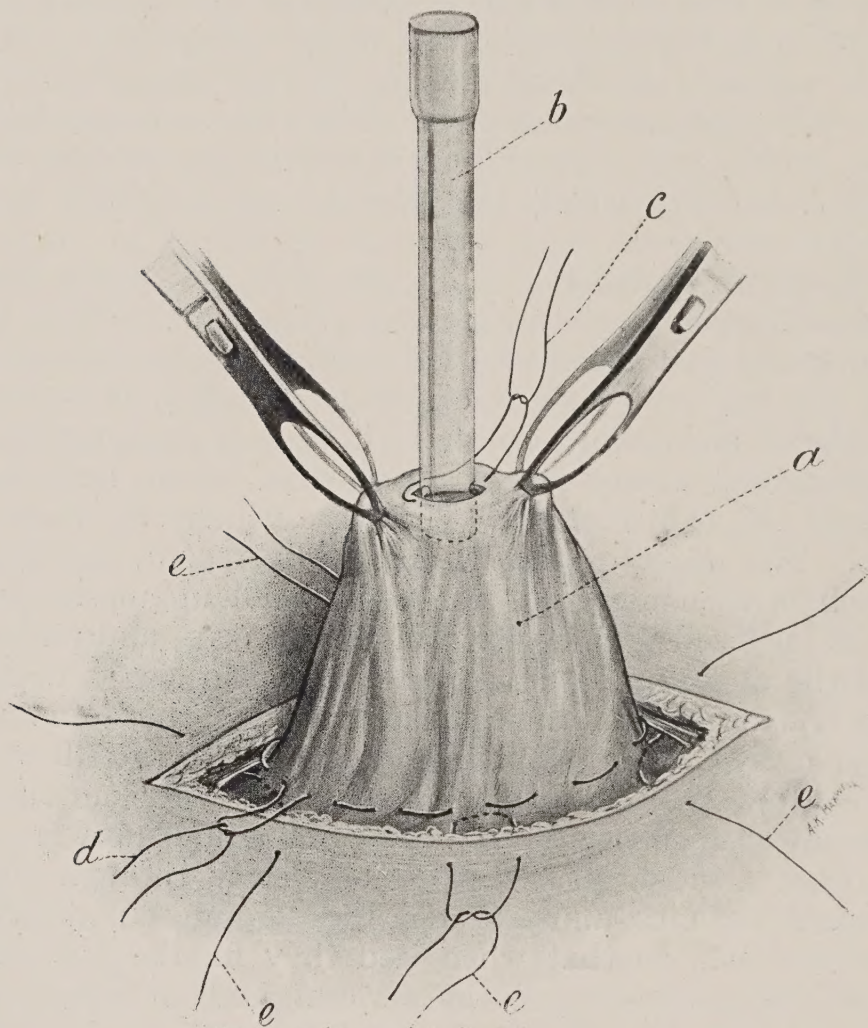


FIG. 21. Gastrostomy by the Kader-Senn method. *a*, Cone of stomach withdrawn; *b*, gastrostomy tube fixed into cone by suture, *c*; *d*, purse-string suture ready for tightening after inversion of cone; *e*, the sutures for fixing the base of the cone to the abdominal parietes.

and below the tube to efficiently close it, and thus complete the operation (*see* Fig. 22). A small cork is fixed in the tube to prevent any gastric regurgitation. A little dressing is placed around the tube, care being taken that no pressure is exercised on the latter.

The after-treatment of these cases is of considerable

importance. In cases of great weakness the operation should be performed without a general anæsthetic, a local anæsthetic being used to numb the line of the skin incision. In these advanced cases a few ounces of peptonised milk, with a little stimulant added, should be inserted into the stomach at the completion of the operation. In other cases

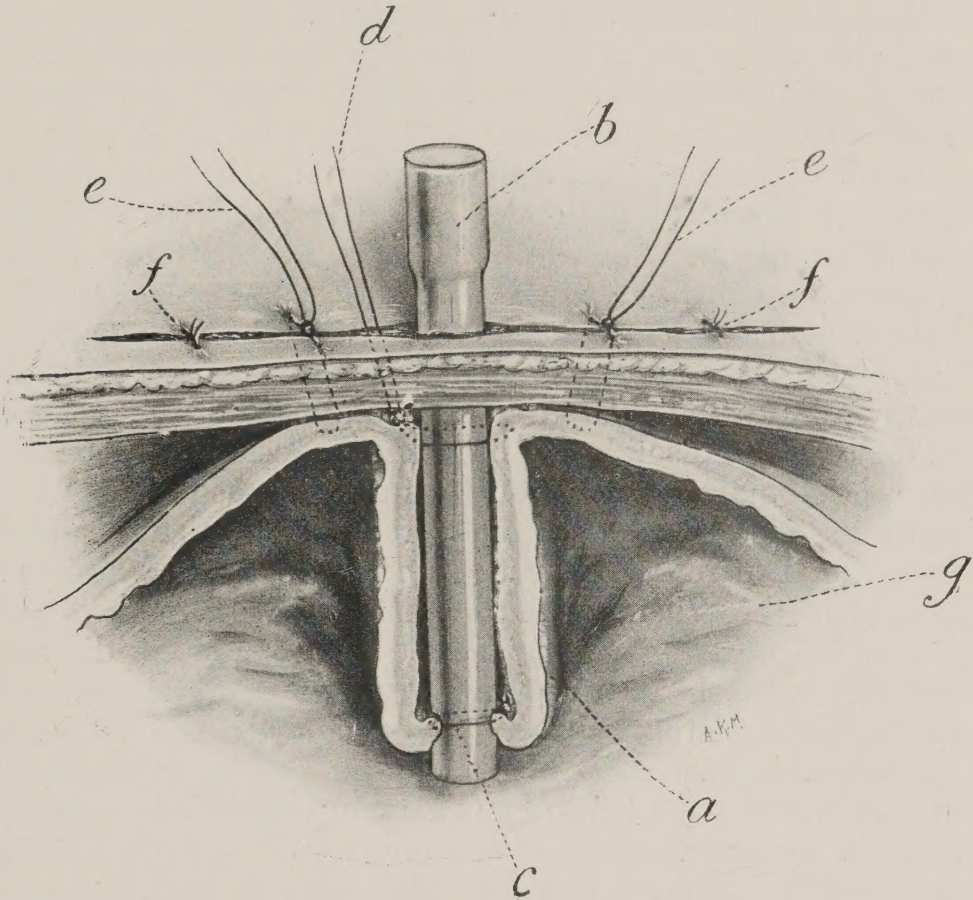


FIG. 22. Gastrostomy by the Kader-Senn method. Operation completed. *a, b, c, d, e*, represent structures similar to Fig. 21; *f, f*, coaptng sutures at the end of the parietal wound; *g*, interior of stomach.

the after-treatment should be just such as would be carried out after any ordinary operation where a general anæsthetic has been administered; that is, that as soon as the effects of the anæsthesia have passed off, nourishment should be given only by way of the gastric fistula instead of by the mouth. It has always to be remembered that these patients are in a state of semi-starvation, and the one thing needed as soon as possible is the administration of food. The

method of performing the operation fortunately admits of this treatment being carried out without any delay, the risk of any leakage being practically nil.

With the object of giving nourishment of a more substantial and nutritious kind, I gradually increased the size of the gastrostomy tube until I obtained one sufficiently large to insert almost solid food. For I found that I was able to use a much larger tube than that usually employed, without any risks of exceeding the limits beyond which the gastric valve could effect efficient occlusion. The special glass gastrostomy tube used measures 9 millimetres in its internal diameter and 12.5 in its external. The glass syringe used for the introduction of food (*see* Fig. 23) holds six ounces, and has a nozzle of the same dimensions as the gastrostomy tube. A glass filler with a large-sized rubber tube attached may, in some cases where the syringe is not employed, be used for the introduction of food through the gastrostomy tube; its large calibre admits of a good deal of finely divided solid food in fluid suspension being passed into the stomach. In the course of a week or so the gastrostomy tube loosens and becomes free. The filler and rubber tube are then replaced by the syringe for the administration of food. When the syringe is filled with food of considerable consistency, the nozzle is introduced directly into the stomach, and then, by the aid of the force exercised through the piston, the food is driven into the stomach. At this early stage there may be a tendency for the contents of the stomach to leak out; a little prolonged pressure, however, or the application of a gauze pad, will prove quite sufficient to stop any leakage. Still later, it will become a question of the fistula tending to narrow so that the nozzle of the syringe cannot be easily inserted. To obviate this a vulcanite plug is used of the shape shown in the figure. It is worn by the patient during the time between the feeds. By this means the channel is kept sufficiently patent. It should be noted that in refilling the syringe while still within the stomach, the small hole at the bottom of the tube close to the junction of the nozzle, which must be held closed while food is being propelled into the stomach, is left open to withdraw the piston, thus avoiding any suction action on the contents of the stomach.

The complete set of the apparatus for the operation and

after-treatment were made for me by Messrs. Baird

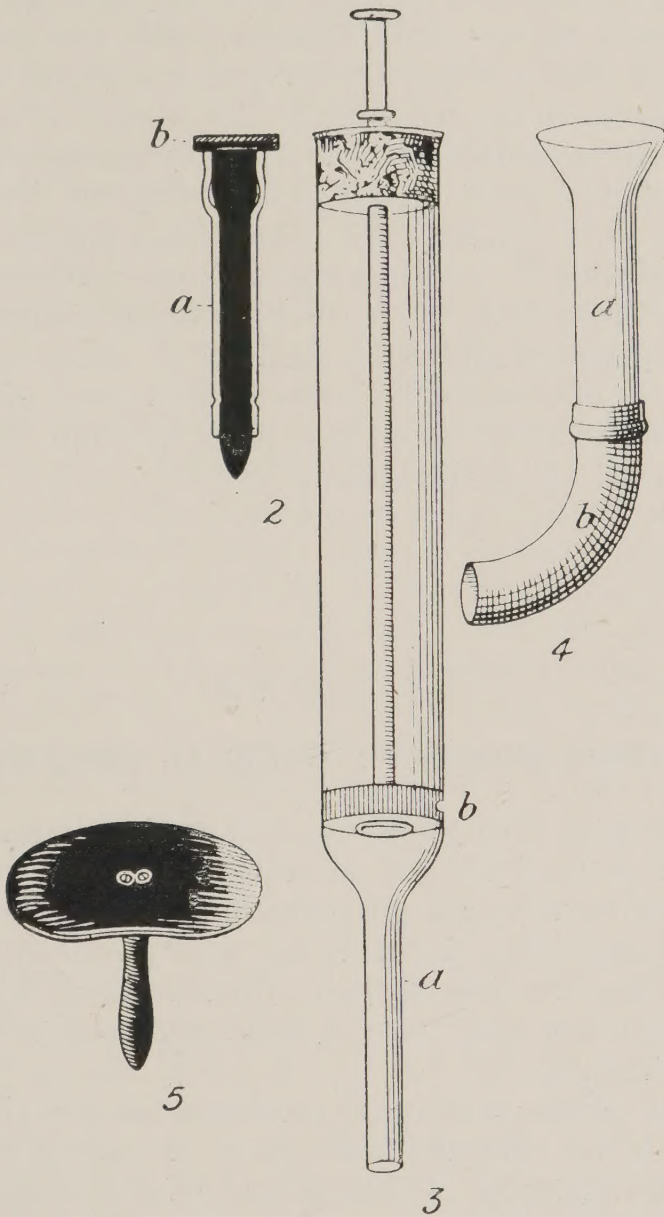


FIG. 23. Apparatus for the operation and after-treatment of gastrostomy. 2. Glass tube for insertion at operation, with vulcanite guide, *b*, for subsequent use when required. 3. Feeding syringe: *a*, long nozzle of syringe for direct insertion into the stomach or for use with the tube; *b*, small hole to admit of piston being withdrawn and syringe refilled without removal from the stomach. 4. Glass filler, *a*, with rubber tube, *b*, for use with tube 2, when the syringe is not employed. 5. Vulcanite plug for use between periods of feeding, and to keep the fistula sufficiently patent.

Brothers, 97 Bath Street, Glasgow, from whom they can be obtained.

As regards my own personal experience of this operation, I have performed it twenty-seven times, with one death as an immediate result; it is, however, only fair to say that in this particular instance the patient was all but moribund at the time of the operation. Under a general anæsthetic it is usually executed in less than ten minutes, and on four occasions I have done it in six minutes. With a local anæsthetic only, I have done it in twelve minutes. Shock is thus reduced to a minimum, and the patients rapidly rally from the operation. It need hardly be said, therefore, that an operation which lends itself to such rapidity of execution is one peculiarly suited for a class of cases so reduced in strength as are those suffering from obstructive carcinoma of the œsophagus.

CHAPTER VIII

GASTRIC SURGERY : GENERAL REMARKS

BEFORE dealing with those diseases of the stomach which are now recognised as more suitable for surgical treatment, there are a few thoughts to which I should like to give expression regarding the anatomy and physiology of this viscus. They are not without their bearing both upon the diagnosis and symptoms of disease, as well as upon the subject of treatment.

The first points worthy of consideration are those connected with the normal conditions of a healthy stomach: Where is it situated? What is its shape? What are its functions? References to works on anatomy and physiology will give answers to all these questions, but do these answers supply all the information we require?

Let us take, first, the position of the stomach and its form. Exploratory operations in life have afforded us an opportunity of acquiring information on these points not altogether in agreement with the post-mortem descriptions of the anatomist. The latter depicts a viscus of definite shape and capacity, with fixed points of attachment of the cardiac and pyloric extremities; but these are not the

conditions we usually encounter when chance affords us the opportunity of inspecting or examining the healthy organ *in situ*. It is quite probable that the cardiac orifice is fairly constant in its situation, and "corresponds," as the anatomist tells us, "posteriorly, to a point slightly to the left and below the ninth dorsal spine, and anteriorly, to a point just below the junction of the seventh costal cartilage with the sternum on the left side." The position of the pylorus is extremely variable. While usually given as "corresponding to a point close to the extremity of the eighth rib on the right side," it may assume positions quite natural to it at variable spots more or less distant from that given. It is, however, with the body of the stomach that the surgeon finds a viscus so little like the one classically described. For not only does he find no constancy in its situation, but its shape suggests to him that of a large muscular tube curved in its course from the gullet to the duodenum, and placed well up under the costal arch. Indeed, it would seem that the perfectly healthy stomach simply expands according to the amount it receives, and that when empty it is in a passively contracted condition, presenting the shape above described. That the normal shape is as just indicated is still further corroborated by photographs taken with the X-rays, the organ being slightly distended with bismuth oxychloride. This shape is well figured in some X-ray photographs by Archibald Maclaren and Louis E. Daugherty. Taken with the individual in the standing position, they state: "We were surprised to find that all our pictures showed the stomach hanging vertically down in the abdomen, hung from the œsophageal opening, slightly curved to the right like a big letter J" (see *Annals of Surgery*, September 1911, p. 312). This same configuration is borne out by Hertz in an address on "Investigations of the Motor Functions of the Alimentary Canal by means of the X-rays" (*British Medical Journal*, 1912, vol. i, p. 225); see Figs. 24 and 25.

There is no just reason for supposing that the stomach differs from other viscera similarly constructed. Thus, the colon when empty is in a passively contracted condition. It can often be felt like a cord rolling under the fingers when pressure is exercised in the right or left iliac fossa. The urinary bladder similarly only assumes the shape

usually depicted when partially distended with urine; when empty its internal walls are in contact, and it lies low down in the pelvis flattened against the pelvic parietes.

The force of these anatomical remarks on the stomach have their practical bearing on the nature of the physical signs so often erroneously given regarding the supposed normal area of gastric tympanicity. It will frequently be found stated that the normal gastric note is to be heard over a certain defined area, when in reality the existence

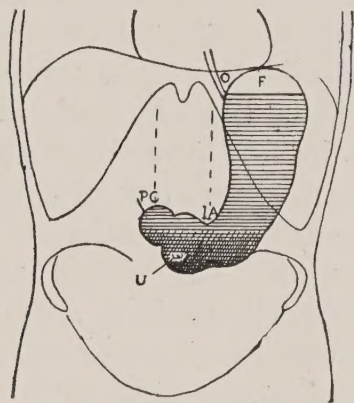


FIG. 24. Normal stomach in the vertical position.

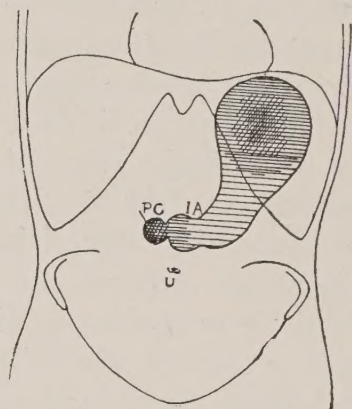


FIG. 25. Normal stomach in the horizontal position.

o, end of the œsophagus; F, fundus of the stomach containing gas; IA, incisura angularis; PC, pyloric canal; U, umbilicus.
(After Hertz.)

of a note at all is an accidental coincidence dependent upon the presence at the time of air or gas in the organ, just as resonance in the colon is a temporary symptom indicating that the canal at the particular time when percussed happens to contain gas. Clinically, therefore, there is no such sign as a fixed normal area of gastric resonance. The only real value of percussion is in the case of an artificially distended viscus, indicating, as it does, an abnormal increase in the capacity of the gastric cavity. With regard to the functions of the stomach, the really typically perfect organ must be a comparatively rare possession; the abnormal normal viscus—if one may so express it—is the type most commonly met with. What I mean by the functionally perfect organ is one which can digest every reasonable kind and quantity of food intro-

duced into it without the least immediate or remote discomfort, and what I mean by the abnormal normal stomach is one which will equally well perform its allotted work provided certain precautions are exercised regarding both the quantity and quality of the food taken.

In the case of the perfect type there must exist such a reserve and balance of the various gastric secretions that no more and no less is secreted than is required for the complete digestion of all foods introduced ; but with the other and common type these niceties of secretory adjustment—so well worked out and proved by Pawlow in his experimental investigations on digestion—do not exist ; and it is with the vagaries of this latter type that it is necessary to deal if we are properly to appreciate all that they signify in connection with our work on the stomach, be it with regard to diagnosis or to treatment. I do not know whether it is necessary for me to present an actual illustration in life in order to clearly indicate the potentialities of such a perfect organ, but there comes to my memory one happy possessor of such a viscus who was well known and highly respected in the profession both in this country and abroad. He was no gourmand, although he dearly loved a good dinner and always did due justice to it. It was usually a looked-for conclusion to the banquet to see what of the viands remained within reach of this beloved physician ; and it was lucky for those who had the honour and privilege to sit next to him that they had succeeded in draining their own glasses ; for in his fits of absent-mindedness he would, quite inadvertently, appropriate his neighbours' wine. His postprandial slumbers were both sweet and frequent, and I do not know that he was ever heard to complain of the previous evening's enjoyments. He died in good old age, and from causes in no way connected with his gastric exercises.

The general subject of digestion is one too vast to enter upon with any approach to completeness, and quite without the pale of the surgeon to attempt more than the briefest allusion to such phases of it as concern his practical work.

That the normal stomach has certain variations in its structural and functional parts is only in keeping with the variations which exist in the body as a whole, and serve to constitute the differences that distinguish one

individual from another. We may therefore have a stomach in which the want of balance between the secretion of acids and ferments is such that perfect functional activity can only be attained by the constant exercise of certain precautions regarding the kind and quantity of food taken ; but as long as these necessary precautions are taken, perfect health is maintained just as well as where the viscus is so constituted that no such attention to diet is required. To some extent, these differences, in the relative proportions of one ingredient of the gastric juice to another, constitute the idiosyncrasies of the individual. But there is something in addition which is far more difficult to explain, and yet of equal practical importance to us in the treatment of our patients. I refer to that mysterious predilection or distaste which certain individuals have for particular foods, and which in some cases reaches such a pitch of gravity that these foods may act almost like a poison. Thus, just to give one instance, I knew an old lady, remarkably wiry and healthy, who lived till she was over ninety, and yet, for the whole period of her life, she never took an egg in any shape or form without it made her feel ill ; and so acute was her sensitiveness to the presence of this food in any made-up dish that she could at once detect its presence although its introduction had been quite unknown to her.

These peculiarities apply equally to fluids as to solids, and perhaps in no more marked degree than in the case of alcoholic beverages. Apart altogether from the question of acidity, which in itself might be explained by the effect of this particular property on the gastric juice, there is the peculiar and special attribute of the fluid itself which causes one wine to be distinguished from another. It is these attributes, whatever they may be, that seem to determine the suitability or otherwise of any special wine for consumption by certain individuals. Here, again, I may instance, as an illustration, the case of a well-known scientist who could drink his champagne with pleasure and immunity but was always upset by a glass of hock. But examples of these idiosyncrasies in individuals are too well known to every medical man to need any further illustrations. The practical bearing of these remarks is upon the treatment we are called upon to adopt after

operations upon the stomach, when we desire to feed our patients with such nourishment as they will most easily digest and most readily assimilate to the needs of the body. I have already referred to this practical side of the subject when dealing with Post-operative Treatment (*see* p. 77); but in the above remarks I trust I have, by giving reasons, more fully established the force of the advice given. To find out the patient's idiosyncrasies with regard to diet in the only way it is possible, by questioning them directly upon the point, is to avoid the administration of such articles as may disagree, and to give only those that will nourish and satisfy. It is my almost universal practice to ask a patient what he would like, and over and over again have I been impressed with the wisdom of this method of selecting the required diet. I well remember once asking an elderly gentleman—after having performed a gastro-jejunostomy upon him for pyloric obstruction—what he would like. Prior to his operation he had lost all relish for food and had no inclination to take anything. His reply, with a doubtful smile on his face from fear that I would not entertain his wish, was, "I would like some steamed potatoes." I said, "You shall have them." He not only took them and thoroughly enjoyed them, but they seemed to prove the starting stimulus for his relish for food; and from that time onwards he made rapid progress. Poor potatoes! How often do patients tell me, with an air of virtue in their reply, that they never touch potatoes; and when I ask the reason why, it invariably is that their doctor has told them not to do so. Why this professional antipathy to the Irishman's staple diet I do not know. An imperfectly cooked potato one can well understand is a most indigestible article, but not so one well steamed or boiled. Raw-meat juice is a food the very thought or sight of sickens some patients, but I have known patients ask for it and at once commence to thrive on it. Milk, one of the unquestionably most valuable foods for administration in post-operative cases, is curiously objected to every now and again; and when a patient professes a dislike to its administration, it should not be enforced, however greatly we may esteem its nutritive value. Alcoholic beverages, whether in the form of spirits or wine, administered without regard to a patient's taste

in the matter, is, I think, a distinct error. Whisky seems to sicken some patients; and the fashionable practice of prescribing this particular medium for alcohol, as better than any other, is often mistaken treatment. I have said enough to need any further reference to details in the matter of suitable dietary materials. If the principle on which action is based is thoroughly well understood, then the practice of carrying out details will follow as a matter of course. All may be summed up in the terse expression: Humour your patients' fancies and not your own.

There are two phases of stomach work which have peculiar and special interest for the surgeon. The first concerns the organ itself, and the second the relationship which it bears to other parts. And first, as regards the organ itself. While the stomach must, in many ways, be considered a highly sensitive viscus, it is, on the other hand, peculiarly undemonstrative when attacked by disease in certain parts. It is quite impossible to satisfactorily explain why an ulcer or tumour situated in the body of the stomach should advance to the extent it is capable of doing without causing grave local symptoms. Indeed, it frequently happens that, with carcinoma, a patient may show marked constitutional disturbances long before local manifestations appear and direct attention to the probable true seat of disease. It almost seems as if to entail local symptoms there must be, as a result of the lesion, some hampering effect upon the movements of the stomach—as, for instance, where the disease has attacked either orifice, the lesser curvature, or has advanced through the body of the organ so as to produce adhesions. And it equally seems as if pain must in some way be associated more with these physical disturbances than, as has sometimes been supposed, with the chemical action of the acid juices or the mechanical irritation of the ingested food. As showing how little, if at all, a patient may suffer from a malignant ulcer involving the greater curvature of the stomach towards its cardiac end, I well remember, many years ago, a case in my ward of a man admitted to be treated for an old stricture of the urethra. He took his food well and never complained of his stomach. One day, on visiting my ward, I was told that he had died: that he had been suddenly

seized with acute abdominal pain, and had died shortly after. A post-mortem was conducted by the pathologist, and we were surprised to receive the information that he had died of a perforated carcinomatous ulcer in the situation above indicated.

This illustration, together with the remarks which preceded it, serve to indicate how great are the difficulties sometimes associated with the diagnosis of gastric disease.

And this leads me to offer a few more general remarks upon the best indications for advising operation. So vague and so indefinite are, in many cases, the symptoms of early gastric disease, that I am now accustomed to attach more importance to the intractable nature of a complaint than to any particular symptoms which it may manifest. So many symptoms are common to different derangements that they often possess but little diagnostic significance ; so that when they fail to respond to treatment within a reasonable period of time, I consider the grounds are sufficiently good for suggesting operative intervention. More particularly do I think the advice sound when pain of a more or less persistent character proves to be a prominent symptom.

The second phase of stomach work—the relation of gastric symptoms to affections of more remote parts—has come to be one of the most important which confronts the surgeon. It is the strictly true clinical aspect of the subject. For it is, as a rule, not the case of our having presented to us a patient suffering from a distinct and definite disease which requires a clearly prescribed line of treatment ; rather is it that we are confronted with a patient whose sufferings suggest a gastric disturbance, but by no means of such a character as to enable us at once to suggest operative intervention. It is impossible to deny that the surgeon is often, nowadays, called upon to discriminate between cases that are really functional and need simple medical treatment and those that have symptoms indicative of a lesion which surgery alone can effectually deal with. Thus, then, every surgeon must approach his case with a mind open and free to consider the three primary questions which it may be justly said every supposed stomach condition presents. These three questions are : (1) Are the symptoms of gastric origin ?—that is,

while apparently gastric, are they the result of disease elsewhere? (2) If unmistakably gastric, are they due, primarily, to disease in some other part? (3) Are they definitely the result of an affection of the stomach itself? Answers to these several questions have, in a more general way, been given in connection with the chapter on "Difficulties in Diagnosis and Problems in Prognosis" (*see* p. 13). It is, however, none the less right that they should, to some extent, be again referred to here when dealing exclusively with the stomach.

Perhaps no organ in the abdomen has falsely attributed to it more complaints than the stomach. Its situation in almost the very centre of the trunk, and in close proximity to so many other important viscera, renders it extremely likely to be associated at times with the production of symptoms which really have their connections elsewhere. But entirely apart from mistakes of this nature, where the symptoms only, as it were, simulate true gastric manifestations, there are those of really gastric origin evoked by disease which deleteriously disturbs the functions of the organ but does not organically implicate its structure. Although the stomach often seems to be peculiarly undemonstrative when itself grossly involved in disease, we still have to regard it as very sensitive to certain direct and indirect influences. Thus, both through the circulatory and the nervous systems it will, sometimes, so prominently and almost provokingly give evidence of its disturbed condition, that we are blindly led to see only its symptoms and overlook others which will give the real clue to the true disease. Thus, any check to the portal circulation from hepatic disease, or impediments or imperfections in the blood-supply arising from other lesions associated with the heart or the lungs, will often produce very pronounced gastric symptoms. Again, through the nervous system we may have most striking examples of how the digestive functions are disturbed by diseases so far apart as those connected with the brain and the female reproductive organs; and these affections may be functional or organic. Of all the puzzling problems that the stomach may present us with, none seem so mysterious and so difficult to understand as those which, for want of a better term, we are wont to designate neurotic. I shall again refer to these

cases more fully, because of the inexplicable curative effects of exploratory operations upon some of them.

Perhaps the most forcible illustrations of how the stomach may unjustly suffer for the sins of other parts are to be found in connection with the system of which it forms so important a part, the alimentary. There is not a section of the canal from the mouth to the anus that may not exercise a deleterious influence upon the stomach, and cause symptoms of a most misleading character. Such a simple and easily overlooked condition as pyorrhœa from periodontal inflammation may upset the stomach. Of a similar nature, and probably more common still, are defects in mastication due to diseased teeth or the absence of teeth. I often think we fail to realise what important parts efficient mastication and sufficient salivation play in the rôle of a healthy digestion. Pawlow's experiments beautifully showed how dependent one part of the digestive apparatus is upon another; that one secretion called forth another, and so each played its allotted share in the work of perfect digestion and metabolism. If the saliva has insufficient time and opportunity to produce its chemical changes, and the teeth fail to effect that division and maceration of the food necessary for these changes, the ingesta arrive in the stomach quite unfit to excite those other additional processes peculiar to the organ and necessary to good digestion. Thus, the stomach rebels, and asserts its disapproval in a way that causes it to be accused for what it is not responsible.

If we now look at the part of the canal distal to the stomach we again find that mischief here may similarly cause very marked gastric manifestations. Perhaps no better illustrations are to be found than in the case of obstructive diseases in the colon. Even such a purely functional disorder as simple chronic constipation may derange the stomach; but the really striking cases are those of serious organic disease, as, for instance, carcinoma. In cases of this latter kind it is frequently stomach disorders that the patient first complains of; it is no uncommon statement to hear that the patient is troubled with so-called bilious attacks.

What is the real association between the symptoms of gastric disorder and the disease in the colon it is difficult

to explain. It may be that the obstruction extends right up to the stomach, and so, to a certain extent, impedes the normal expulsion of its contents. But it is probable that some more intricate process is at work—such, for instance, as the absorption of toxins, the result of fermentative changes in the *fæces* detained in the large bowel.

The rectum is not without its power of producing disturbing influences upon the stomach, probably for the same reasons as have been given in connection with the colon. It is an inexplicable fact that occasionally we encounter cases where the stomach is very grossly disturbed by the administration of nutrient enemata. Patients will vomit and complain that they can taste certain ingredients which have been introduced. It has also been noticed, as a physiological fact, that the stomach secretes abundantly when rectal enemata are given. These facts are of some clinical interest, because it is probable that we do not get all the rest we are wont to expect and hope for after operation, by rectal feeding.

Lastly, the stomach can be made to manifest its discomfort by being displaced or dragged upon by adhesions. There is little doubt that certain external causes, such as tight-lacing, may deleteriously hamper the organ's action ; but such displacement is slight in comparison with the possible disturbing effects of adhesions. Any drag on the omentum by adhesions in the pelvis may very materially pull the stomach downwards, and so interfere with its power to contract and perfectly expel its contents. Adhesions arising from inflammation connected with a local or general peritonitis may subsequently hamper the organ in its functions ; this, however, is a subject I have dealt with at considerable length in a previous chapter (chap. vi), and need not, therefore, further enlarge upon it here.

I trust I have said sufficient to indicate the advisability, perhaps I should say necessity, of every surgeon rendering himself adequately cognisant of the many pitfalls that lie in his path before he can safely consider his case one suitable for operation. The knowledge required is really diagnostic, and must be fairly comprehensive in this respect ; but the matter of treatment is practically limited in the sense that he is only concerned with those cases that require operation. I hope, therefore, I shall not be

considered as trenching on the domain of the general practitioner or the consulting physician. The best results and the best information will always be obtained where and when one and all work in conjunction.

The surgical affections with which I propose to deal in the following chapters are : Chronic ulcer with its sequelæ, hæmorrhage and perforation ; pyloric obstruction ; gastrectasia ; gastropptosis ; carcinoma ; tumours ; and neuroses. I have no intention of attempting to deal with these conditions exhaustively ; my guide is principally and primarily my own personal experience. And if a little practical and useful advice can be gleaned from the remarks of one who has spent more than twenty years seeking for light in the midst of much that was and still is dark, my efforts will not have been in vain. In 1895 I wrote as follows : " It is not, I venture to think, too venturesome to predict that the day is not far distant when the stomach will be opened, explored, and resutured for *purely diagnostic purposes* with as much freedom and security as is now done, for instance, in the case of the brain " (" The Surgery of the Alimentary Canal," p. 174). That prophecy was soon, and has been amply, fulfilled. In an address as President of the Glasgow Pathological and Clinical Society I discussed " The Value of Rest as effected by Operation in the Treatment of Certain Diseases of the Alimentary Canal " (*Glasgow Medical Journal*, 1902, vol. lviii, p. 321) ; and one of the suggestions put forward was the adoption of gastro-jejunostomy as a means of giving rest, by artificial drainage, in various conditions affecting the stomach other than those of a purely obstructive character. That suggestion has neither proved advisable nor feasible. Thus, interest and investigation have proved incentives to strive for more knowledge and more success in the treatment of gastric diseases ; and these reasons, I trust, will serve as an apology for venturing to promulgate certain personal opinions and practices which, if not entirely new, have not yet, at least, received that recognition they seem to merit.

CHAPTER IX

**CHRONIC GASTRIC ULCER AND ITS SEQUELÆ,
HÆMORRHAGE AND PERFORATION**

Is it possible to diagnose chronic gastric ulcer?—perhaps I should add, with certainty? Such a question would, I suppose, have been ridiculed not so many years ago. But the intervention of surgical treatment has revealed the fact that in many a case which it had been customary to diagnose as gastric ulcer no such lesion was discovered at operation. It thus became perfectly clear that many of the symptoms which had been deemed unmistakably significant of gastric ulcer owed their origin to other causes. I well remember a distinguished Scottish physician stating that the one symptom requisite in his judgment to establish the diagnosis of gastric ulcer was hæmorrhage; and yet we now know that that symptom has no such certain diagnostic value. We may take all the classical symptoms usually given in text-books, as, for instance, pain in the epigastric region at variable periods after the ingestion of food—and often at other times also—extending through to the back, eructations of acid material, vomiting, flatulence, blood in the vomit or “tarry” stools, pain and tenderness on external pressure at certain points, anæmia, &c., and nevertheless find that ulceration has not been present to account for them. Just to emphasise the truth of these remarks and give that touch of reality to them which always impresses more than all bare statements, let me narrate a couple of cases.

Mary B., aged twenty-six years, was transferred from the medical wards to my ward as a case of gastric ulcer with repeated hæmorrhages. Her story was that she had been troubled with her stomach for about seven years; during this period she had had three attacks of bleeding, respectively seven, five, and three years before. On the third occasion the amount lost was so great that she was off work for three months. She had rarely been without pain of a gnawing character situated in the epigastrium,

which came on from half an hour to an hour after taking food. Her last hæmorrhage came on the day prior to admission to hospital, when she vomited a "chamberful" of blood. When examined she was complaining of nausea, and a gnawing pain over the stomach. The abdominal walls were lax except at the upper part of the left rectus, where there was considerable rigidity. A tender spot was present one inch above and to the left of the umbilicus. The abdomen was opened, and on external examination of the stomach no evidence of ulcer could be discovered in any part; neither was there any constriction of the pylorus, nor were there any adhesions. The stomach was opened, but here again nothing of the nature of ulceration or erosion could be detected.

The second case was that of a young woman aged twenty-three years, who was admitted to my ward as a case of gastric ulcer with hæmatemesis. For seven years she had been troubled with her stomach. At first she suffered from a burning pain, usually after her midday meal; but this gradually became worse until she experienced it after every meal. It was situated in the epigastrium, and frequently extended through to the back; it would last for about two and a half hours or so. She did not at first vomit, but a fortnight prior to admission she suddenly felt sick and vomited a cupful of bright red blood. Since that time she had vomited on three other occasions, always bringing up blood, on the last occasion as much as a teacupful. When admitted she was absolutely blanched and suffering in other ways from loss of blood. The abdomen was opened and the stomach examined; it was quite blanched. A careful external examination revealed nothing; and when the stomach was opened, neither by direct inspection through a speculum nor by digital exploration could any ulcer or erosion be found.

While, therefore, as these cases show, and as has been stated, symptoms of ulceration may exist but no ulcer to account for them be found, it must, nevertheless, be borne in mind that it is rather the exception than the rule that it should be so. The only clear fact which these considerations establish is that the attribute of "certainty" cannot be entertained. William J. Mayo expresses the position pretty accurately when he says, "An ulcer must

be demonstrated by sight and touch before its existence can be regarded as proven."

But there is still another puzzling and obscure side to the picture. We may have gastric ulcer and practically no symptoms. A sudden and perhaps fatal hæmorrhage may prove the first and last indication of ulceration; and equally, the patient may be struck down with a series of prostrating symptoms the result of an entirely unanticipated and unforewarned perforation.

It is only possible to explain these vagaries in the clinical signs of active ulceration on the basis that the situation and character of the lesion has something to answer for.

The outcome, then, of these remarks is to support the doubt given expression to in the introductory question: that while we may make a correct diagnosis, we cannot do so with certainty.

If one symptom more than another is to be selected as possibly conveying the most reliable information, it would be pain. Yet this pain may present the most diverse features, and for that very reason fail in differential significance. Patients may say that pain occurs in the epigastrium after food, sometimes almost immediately and at other times not for two or more hours. The pain is described as "gnawing," "burning," "aching," "cutting," &c. Sometimes it is limited to some part of the epigastrium, and usually to the left of the middle line, or it may extend laterally on each side, and not infrequently it passes through to the back between the shoulder-blades. The seat of the pain and the time of its appearance may help sometimes to give a clue to the seat of the lesion in the stomach. Thus, there would seem some relationship between the length of time which elapses between pain, ingestion, and the distance of the ulcer from the cardiac orifice; that is to say, the farther the ulcer from the cardiac end, the longer the time before the pain appears. Mackenzie, in his careful observations on the reflex manifestations of pain in diseases of the deep abdominal viscera, maintains that ulcers of the stomach situated towards the cardiac end cause pain higher up in the mid-epigastric line than do those located more towards the pyloric extremity. This I have verified. Whether it is possible by any other means to determine the seat of the lesion I do not know. David

Drummond and Rutherford Morison (*British Medical Journal*, 1909, vol. ii, p. 678) state that, almost invariably in their experience, night pain, coming on about one or two o'clock in the morning, indicated that the ulcer was adherent to the pancreas. I have noticed that when a large ulcer is situated on the lesser curvature close to the cardiac end pain is generally felt behind, below the left shoulder-blade, or between the two blades. It is said by some that the position assumed by the patient will aid in determining the seat of an ulcer, but on what ground it is difficult to understand, because, if it is meant to imply that certain positions will free the part from contact with food, then it does not coincide with facts, for I have known a patient find relief from pain when lying on the back where at operation a large chronic ulcer existed near the cardiac orifice on the lesser curvature. In such a case the erect and not the recumbent position should have afforded relief.

There is the greatest possible difference in the lengths of time which the pain may last. Sometimes it seems as if it was only as long as there was food in the stomach, because as soon as the patient vomits there is relief. In other cases, again, the pain continues quite independently of the presence of food; in some of these cases relief is afforded by taking carbonate of soda, which seems to indicate that the pain is due to acidity. Both mechanical and chemical causes appear, therefore, to have an irritating affect, and augment, if they do not actually produce, the pain.

As regards hæmorrhage, it would seem that it can only be considered an accidental accompaniment of ulceration. Just as its amount is dependent upon the situation of the ulcer in respect to any particular blood-vessel, so its actual occurrence at all must be due to the accidental opening up of capillaries or larger vessels in the course of the progressive destructive process.

Hyperchloridia, or hyperacidity, is a very frequent concomitant, and its almost constant presence has led to the belief that it must be probably more a cause than a consequence of the lesion. If it be a cause, then it behoves us to look further afield, and to take the view that hyperacidity and its sequel, ulceration, are themselves, after all,

merely symptoms of a disease which must have its origin from some as yet undiscovered source.

Vomiting is a symptom very frequently present. Why it should occur in some cases and not in others is as difficult to explain as the many other vagaries of this disease.

The chronicity of gastric ulceration presents another problem for solution. Many ulcers undoubtedly heal after giving rise to a definite period of symptoms. Others seem to remain quiescent for variable periods, breaking out now and again, with definite manifestations of activity. I have known a patient's intermittent symptoms date back for seventeen years, and then to find at operation a large ulcer with no indication that it could possibly have been healed at any period. Except where a healed ulcer subsequently gives rise to symptoms indicative of obstruction, it may be usually regarded significant of an unhealed lesion when symptoms of gastric irritation arise from time to time.

In discussing the treatment of gastric ulcer, I have no intention of dealing with the subject from the point of view of dietetics or medicines. Every case, however, before it comes to the surgeon should have been exhaustively dealt with by these measures. It is only when conservative means fail that surgical aid should be called in. The real difficulty is to know when medical efforts should end and surgical treatment begin. As a rule all conservative measures rapidly afford relief; and so great often is the improvement that usually at the end of six weeks or two months a cure is considered to have been effected. If, however, a recrudescence of symptoms takes place after a return to the normal conditions of life, it may fairly be regarded as an indication that the ulcer has not healed; and then is the time to open up the question of operation. Precisely the same reasons may be given as we are wont to entertain in regard to appendicitis. Whatever exception is taken to the performance of appendicectomy during the first attack, there are few, if any, who would not advise the removal of the appendix when the patient is seized with a second attack, because such an attack in the large majority of cases implies that there are conditions present which may at any time lead to mischief of a much graver character than as yet manifested. So with gastric ulcer

a return of the symptoms indicates a persistence of the lesion ; and a gastric ulcer which continues to advance, no matter how slowly or insidiously, carries with it the grave possibilities of perforation with its sequelæ, a localised abscess or a fatal general peritonitis, hæmorrhage, and carcinoma. Any one of these consequences is sufficiently serious to demand prevention by any means that are possible. In what way, then, it may be asked, can surgery hope to accomplish such a requirement ?

In the first place, the ulcer can be excised. But such treatment is only possible when the ulcer is so situated that it can be removed without immediate risk to the patient's life, or without too great damage to the stomach itself or to any other parts with which the lesion is intimately connected. Thus, for instance, it is not possible to remove—or, at least, it is not wise to attempt to do so—large ulcers which involve the lesser curvature close to the cardiac orifice ; nor is it in many cases advisable to venture upon extensive dissections when an ulcer deeply involves the liver above or the pancreas behind. With these exceptions, most ulcers situated elsewhere can be excised. And here I may add a small practical and helpful detail in connection with the removal of ulcers situated on the posterior wall of the stomach. By first incising the anterior wall we may then push through the opening that portion of the posterior wall attacked by the ulcer. By so doing we very materially facilitate excision or the application of a purse-string suture, if that be considered more advisable.

Should we add a gastro-jejunostomy to an excision ? Such treatment is advocated by some. For my own part, I do not quite see the need of it, provided, of course, that the excision is not of such an extreme nature that the necessary suture of the gastric wound would leave an amount of contraction that must cause obstruction if unrelieved by short-circuiting. It is again argued in favour of the anastomosis that it will probably prevent any subsequent formation of another ulcer. But according to the two most experienced authorities on the subject—the Mayos of Rochester, Minn.—95 per cent. of chronic indurated gastric ulcers are single (*Annals of Surgery*, 1911, Part 225, p. 315). Considering, therefore, the years which most of these ulcers take to form and advance, it seems

a very remote possibility that a second ulcer will appear at any future period. The strongest argument, however, for performing a gastro-jejunostomy is probably to be found in the advantageous effect it has on hyperacidity. This condition, apart from the ulcer, gives rise to dyspeptic symptoms. If, therefore, there is proof prior to the operation that there is a considerable excess of free hydrochloric acid, it may be wise to add the anastomotic operation to the excision.

Failing the possibility of excision, we must perform gastro-jejunostomy. That this operation is capable of curing a great many cases there is now no doubt. How it does, it is not possible definitely to state, but it is probable that the ready egress which the artificial opening admits prevents any prolonged irritation of the ulcer by the ingesta ; and, further, the hyperacidity, so constantly present in these cases, is lessened either as the direct result of the easy drainage or that a certain amount of neutralisation is effected by the alkaline bile which, there is good reason to believe, often finds its way into the stomach by this operation. Thus, the treatment simply amounts to giving the ulcer rest, which, we know by analogy elsewhere, is the sole factor requisite for the repair of lesions of this particular character. In proof of the benefit derived from a gastro-jejunostomy, I will cite one case which may be taken as a fair illustration of what surgery may be expected to accomplish in many, if not most, instances of a similar nature.

Annie M., aged twenty-one years, was quite healthy up to four years ago, when she began to suffer pain after food, to vomit, and to feel bodily weak. She was also at this time anæmic. The attacks of painful indigestion had taken place at varying intervals, but about a month prior to admission to hospital the pain became more acute, and everything she took, even milk, was vomited. She stated that the pain was of a sharp and burning character. It was situated in the epigastrium, and radiated from there to the right and left side and through to the back. It usually lasted for about a couple of hours or so. The vomit sometimes contained a little blood. When admitted to the hospital she looked well nourished, with ruddy cheeks. Her tongue was coated with white fur, and her teeth were

bad. Palpation of the abdomen revealed tenderness in the epigastrium about one inch above the umbilicus ; nothing could be made out deeply.

On opening the abdomen the stomach was found retracted and fixed above ; and, on further examination, a large indurated mass was discovered involving the lesser curvature close to the pyloric orifice. Firm adhesions, also, fixed the part to the under-surface of the liver. No attempt was made to excise the ulcer nor to detach the adhesions ; and it was with some difficulty that the usual no-loop operation of posterior gastro-jejunostomy was executed. She made an uninterrupted recovery ; and when seen nineteen months after the operation, the following note was found recorded of her condition in the *Ward Journal* : “ She enjoys most perfect health, and takes her food without the slightest discomfort. She has put on flesh, so that when weighed she was 9 st. 11 lb. as compared with 7 st. 2 lb. when she left the hospital, that is, a gain of 2 st. 9 lb. in one year and seven months.”

When hæmatemesis is a serious symptom it is frequently a question more with reference to that alone than with the ulcer—its probable or possible cause—that we are concerned. Indeed, the treatment of hæmatemesis by operation has to be considered by itself. For we now know that this symptom may be, and indeed often is, one quite unconnected with chronic gastric ulcer. If it were possible to differentiate between chronic gastric ulcer and other less obvious causes, the decision regarding the right course to pursue would not be so difficult to arrive at. For, except in the case of copious hæmorrhage resulting from the extension of a chronic gastric ulcer into the splenic artery or other large vessel coursing along one of the curvatures, where, as a result, the patient might be reduced to the verge of death, operation would certainly be the right treatment to adopt. By its means we might be able to secure the bleeding vessel, excise the ulcer, or perform a gastro-jejunostomy. Success has attended each of these proceedings. In illustration of the last mode of treatment let me narrate the following case :

Isa S., aged twenty-two years, had gastric symptoms dating back three years. Her earliest symptoms were attacks of pain after certain articles of diet. She would

vomit, and by this means be relieved of her pain. Nothing suggestive of blood was seen in the vomit at this time. The pain was situated in the epigastrium, and occasionally went through to the back between the shoulders. Her present attack commenced ten days prior to her admission to hospital. It commenced while she was engaged at her usual occupation; she felt sick and had pain in her stomach most of the day. It became so severe about five o'clock in the evening, extending back between her shoulders, that she was obliged to return home. It lasted till early the following morning. She described it as of a continuous gnawing character in the region of the pit of the stomach. It extended with "darts" round both sides and between the shoulders. It was always worst half an hour after taking food. If she vomited she was at once relieved, but she also obtained relief by the external application of heat and by lying on her left side. She had been living chiefly on milk. When admitted to the hospital she looked very pale and ill, though not emaciated. She vomited about half an hour after taking food; even milk was rejected. Blood was frequently seen in the vomit, and on one occasion as much as a pint was brought up. On examination of the abdomen, there was resistance and tenderness over the whole epigastric region; but no particularly localised, painful spot could be detected.

On opening the abdomen an indurated mass was at once discovered, involving the lesser curvature of the stomach close to the cardiac orifice. The stomach itself was distended with gas and very blanched in appearance. There were too many adhesions connected with the mass to admit of separation; and it was with considerable difficulty that the viscus was sufficiently withdrawn for the performance of a no-loop, posterior gastro-jejunostomy. Prior to completion of the anastomosis, a digital examination of the interior of the stomach was made. A large and deep excavated ulcer with indurated margins was felt at the seat of the mass detected externally. She made an uninterrupted recovery, and when reporting herself nine months later the following note is recorded in the *Ward Journal*: "She is very well indeed, and looks plump, of good colour, and in good spirits. Her weight is 9 st. 2 lb., that is, a gain of 1 st. 11 lb. since leaving hospital. There

has been no recurrence of symptoms, no indigestion, no vomiting, no hæmatemesis. The wound is perfectly satisfactory."

Hæmorrhage arising from other causes cannot be considered as suitable for operation; and by operation is meant gastro-jejunostomy, for the causes which give rise to it are not of the same isolated and localised character, and not, therefore, likely to be benefited by the rest which such an operation is supposed to afford. If, therefore, as must sometimes happen, the surgeon fails to find an ulcer as an explanation of the hæmorrhage, he would be wiser to be satisfied with the negative findings of an exploratory gastrotomy than to proceed to the performance of a gastro-jejunostomy. The operation, by failing to do any good and, possibly, by being followed by a fatal result quite unconnected with its execution, would risk bringing unmerited discredit upon a measure frequently so worthy of commendation.

The perforation of a chronic gastric ulcer deserves separate consideration; for, although a sequel to ulceration, its sudden occurrence and the gravity of the accident render it a subject of the utmost importance.

When once a chronic ulcer has reached the serous tunic of the stomach the future result of its progress depends primarily upon two circumstances, whether it can or cannot form attachments to some part that will enable it still to continue its destructive path without causing a sudden crisis. Judging from experience, it would almost seem that the only part of the stomach which may fail to acquire the necessary protective attachments is the anterior wall. When, therefore, an ulcer occupies any part of this region, advance means, as a rule, an opening directly into the general peritoneal cavity. The want of structures here with which the base or floor of the ulcer might form an intimate connection probably explains the fact that perforation occurs and serious symptoms arise long before the ulcer has had time to assume the proportions which we are wont to find it does when occurring in other regions.

Perforation is a term we are apt to associate only with those cases where there is a sudden leakage into the general peritoneal cavity, but it equally applies to every ulcer

which has advanced through the entire gastric parietes ; for it is merely an accident in the seat of the lesion that its connections happen to be such that sudden clinical manifestations, similar to those we are familiar with in an ulcer situated in the anterior wall, are prevented.

There is one remarkable feature deserving special notice about those ulcers which, while they have perforated the gastric wall, have not provoked symptoms of any sudden gravity by reason of the protective attachments they have made. It is, that by being permitted to continue their sluggish advance, an amount of infiltration of the surrounding tissues takes place which renders them, when discovered at operation, liable to be mistaken for malignant disease. No doubt much of this thickening is due to œdema and organised inflammatory exudates partaking of the characters we are familiar with in chronic ulcers occurring in other parts, such, for instance, as the legs. The comparatively lax condition of the subserous, submucous, and surrounding connective tissues probably admits of this infiltration extending considerably beyond the immediate limits of the lesion ; so that when the ulcer, for instance, is situated in the neighbourhood of the pylorus it may completely encircle this end of the stomach ; indeed, it may do so when the lesion occupies some part in the mid-gastric region causing a contraction which results in the well-known " hour-glass " condition of the viscus. Whether it is right to apply a special term to this peculiarity of the inflammatory infiltration, such as has been proposed by Professor Alexis Thomson, by calling it " fibromatosis," may be open to question. It has, however, frequently been mistaken for carcinoma of the stomach, and no doubt accounts for many of those mysterious disappearances which we have mistakenly construed and described as cures of carcinoma by operation. I can recall a very striking instance of my own in an elderly man upon whom I operated for a gastric condition, the nature of which I was undecided upon before operation. After opening the abdomen I found a large mass involving the greater curvature of the stomach in the splenic region. It included in its embrace the colon and neighbouring tissues, and so extensive did its connections appear that I considered it must be carcinoma. I therefore attempted nothing further,

and closed the abdomen. The patient lived for a few weeks ; and then a post-mortem revealed the nature of the lesion, which proved to be a chronic ulcer that had perforated, contracted numerous dense adhesions to neighbouring tissues, and so infiltrated the region that a solid mass, without any differentiation of the parts, was the result.

But a perforating ulcer may go further than merely produce a simple, and what may be termed an innocent, infiltration of the tissues ; an abscess may result. It is certainly a very striking fact how rarely these ulcers seem to become infected by pathogenic micro-organisms. An abscess, though an occasional sequel, is by no means a common one. So long as the entire surface of the ulcer is exposed to the gastric juices it would appear that these have to some extent a sterilising effect ; but if, through advance of the necrotic process, some part gets cut off from contact with the gastric secretions, any chance infection has an opportunity to increase, and so develop an inflammatory process that extends until definite symptoms arise indicative of the nature of the new complication. There is no region exempt from the formation of an abscess arising from such a source. But the seat of the lesion may very materially affect the course and extent of its progress. Should the abscess form in the neighbourhood of a hollow viscus, it may discharge itself into that viscus ; and this sometimes happens with the stomach itself. But experience seems to teach that an abscess associated with an ulcer either on the front or back of the stomach takes a more or less upward course, in the former case above the liver, in the latter behind it, and in each instance reaches the under-surface of the diaphragm. When an accumulation takes place here it constitutes the so-called "subphrenic" or "subdiaphragmatic" abscess. The further progress of such an abscess is either to point anteriorly in the epigastric region or to rupture into the pleural cavity, with the consequent production of empyæma.

The symptoms associated with suppuration the result of a chronic ulcer are those of the usual septic character—elevation of temperature, sometimes preceded with shivering, and other accompaniments of fever. Palpation may evoke tenderness ; but the proximity of the inflamed area

to parts accessible to pressure will determine the amount of pain produced by physical examination. The involvement of the lung or pleura will call forth symptoms sufficiently suggestive of such a complication. Should, by any chance, the abscess burst into the general peritoneal cavity, an acute crisis will follow indicative of the onset of acute peritonitis. The sudden subsidence of all symptoms may usually be taken to mean rupture of the abscess into the bowel or the stomach ; and this natural way of affording relief, and which is often followed by a complete cure, may be taken as a guide to the way in which artificial measures should be employed. Unless there are good signs to show that the abscess has come sufficiently near the surface of the body to be evacuated by a simple and direct cut into it, an exploratory needle should be cautiously introduced. A detection of pus is a sufficient indication that it must be let out ; and we should seek to do no more than drain by as little dissection and disturbance to surrounding parts as possible. There is no need to flush the abscess cavity, no matter how foetid its contents ; neither should it be swabbed out or stuffed with any antiseptic dressing ; the less it is interfered with the better ; such meddlesome treatment will do no good, and may quite easily do harm. Unless the patient is toxic from septic infection, the evacuation of these abscesses either naturally or by incision will usually result in cure.

I now revert to the discussion of those perforations which take place directly into the general peritoneal cavity. At one time they were regarded as among the most fatal complications of gastric ulcer, for death within twenty-four or forty-eight hours was the usual result ; but now, since the intervention of surgical treatment and the better knowledge we have of the initial symptoms indicative of the accident, they might even be regarded as among the least serious. It may seem too optimistic a view to take of such a complication ; and yet it may be safely said that if operation be undertaken within a few hours of the perforation almost every case will be cured.

The ulcers which perforate into the general peritoneal cavity are usually situated on the anterior surface of the stomach, and very frequently nearer to the pylorus than elsewhere. These ulcers, also, are often very small,

with perforations, sometimes, little larger than a pin-hole.

There seems to be no time more than another when perforation is likely to occur, and no known cause why it should happen when it does. Often enough it takes place when the patient is at rest; and often, too, when the stomach is empty.

As regards symptoms other than those connected with the sudden attack of prostrating pain, the loss of liver dullness is one to which some importance is attached. It is, however, by no means reliable, and possibly is solely dependent on the accidental existence of a superabundance of gas in the stomach at the time when the perforation takes place. Apart, also, from this, a distended colon will sometimes overlap the hepatic margin and cause a misleading tympanitic note.

Another symptom, to which considerable significance is justly attached, is rigidity of the abdominal parietes. The recti muscles, especially in their upper part, become almost as hard as a board; and although this condition occurs in the initial stages of acute peritonitis from any cause, it appears to be particularly well marked and early in its appearance in perforation of a gastric ulcer. It is a reflex contraction of the muscles, and tends to disappear as the peritonitis advances and the patient becomes more toxic.

I may add a word or two here on the difficult question of differential diagnosis, if only to emphasise the fact that it is more important to recognise the gravity of the existing conditions than to waste valuable time in seeking to determine the actual cause of them. When a patient is suddenly struck down with acute and prostrating abdominal symptoms, it should be at once recognised that the case is, in all probability, one for early surgical intervention. For, if we run through the possible causes of such a crisis, there is not one which would not fall within the category of those that are now deemed suitable for operation at the earliest possible date. Thus, perforation and rupture of any of the abdominal viscera contained within the general peritoneal cavity—including, therefore, the duodenum, small and large intestine, the appendix, and ectopic pregnancies, acute intestinal obstruction from any cause, acute

hæmorrhagic pancreatitis, and some of the acute forms of septic peritonitis—are all embraced in this class. Even this long list does not exhaust all the possible causes of an acute prostrating crisis. But it will be sufficiently evident that in not one of these cases should time be wasted in seeking for the primary cause. Although I say “wasted,” I do not mean that we should not attempt to discover the source of the trouble, for the very good reason that material assistance would be derived if we were able to locate the lesion ; we should, then, be better able to open the abdomen at such places as would enable us more effectually to deal with it. The information is often best acquired from the previous history of the patient’s life ; although it does sometimes happen, especially in the case of a ruptured gastric or duodenal ulcer, a perforated appendix, or a ruptured ectopic pregnancy, that a spot may be detected where there is a degree of sensitiveness to palpation above that elicited elsewhere. However, facts connected with the history of the case are likely to prove of most assistance. If, therefore, we obtain an account of previous attacks of indigestion, and especially if these attacks suggest gastric or duodenal ulceration, we may regard the initial source of the trouble as probably connected with one or other of these viscera. On the other hand, pain felt previously in the right iliac fossa would reasonably lead to the suspicion that the vermiform appendix was primarily at fault.

In the case of young recently married women a possible ruptured ectopic pregnancy should always be borne in mind ; and the fact may be almost definitely settled by an examination *per vaginam*, when a sudden propulsion upwards of the uterus or pressure in either of the fornices will cause acute pain.

To revert to the subject with which we are specially concerned—perforation of a gastric ulcer into the general peritoneal cavity—the question of treatment may now be discussed.

The abdomen may be opened by any incision above the umbilicus ; my own preference is for the transverse, which can be extended in either direction as required. If the case is a late one, and there is reason to fear toxæmia, the more quickly the operation is completed the better ; and therefore the median is preferable, because it can be

closed with through-and-through sutures, while a longer time is needed for serial sutures in the transverse incision. The escape, on opening the peritoneal cavity, of scentless gas or a little turbid fluid with flakes or particles of foreign material, almost confirms the diagnosis of ruptured gastric ulcer ; a search may, then, be confidently made for the lesion. Often, from the small size of the ulcer and, more particularly, of the perforation, the search must be a very thorough one, for it is very easy to overlook the seat of rupture. When found, several courses are open for us to adopt. If the ulcer is small and freely accessible, the radical treatment of excision may be practised. If this ideal procedure cannot be carried out, it may be possible to encircle the ulcer with a purse-string suture and invaginate it. If there is much surrounding œdema, the tissues are friable and the sutures liable to cut out, in which case a series of interrupted Lembert stitches should be introduced to give further support and security. Cases will occasionally occur in which it is impossible to satisfactorily occlude the opening by suture ; much assistance may then be obtained by stitching a portion of omentum over the part. Whenever there is any doubt regarding the proper and complete prevention of any further leakage, it is advisable to lightly pack with a strip of iodoform gauze or other antiseptic material, one end of which is led out of the abdomen to facilitate its withdrawal.

The performance of gastro-jejunostomy, however advisable at a future time, can hardly be deemed wise under the critical conditions which generally accompany perforations. Our object is to add as little as possible to the existing shock and toxic effects of the accident ; and any procedures which would lengthen materially the time of the operation would almost certainly frustrate, and probably entirely defeat, our efforts.

The line of treatment so far mapped out is almost always successful, provided the remaining part of the operation can be made equally so. This particular part concerns the removal of the extravasated contents of the stomach and the inflammatory products the result of the peritonitis.

If the case be treated within a few hours of the perforation, if the perforation itself be small, and if the escape of the gastric contents be limited, there is likely to be very little

difference of opinion among surgeons regarding the right course to pursue. As much of the effusion as can be carefully wiped away should be, and the abdomen completely closed. If, however, the conditions are advanced and the extravasated material considerable, with, added to it, the results of peritonitis, there is not the same unanimity with regard to the best treatment to adopt. There can, however, be very little doubt on one point, and that, that as much of the extravasated material should be removed as is possible. This semi-purulent exudate will be collected principally in three places—in the pelvic cavity and in both loins, more particularly the right. To effectually remove the foremost material from these places separate incisions must be made. A median incision below the umbilicus will admit of the pelvic cavity being dealt with ; and lateral incisions will effect drainage of the lumbar regions.

Up to this stage the practice of surgeons is fairly uniform ; but difference of opinion arises when the question is solely one of *how* best to remove the fluid in the peritoneal cavity, and whether drainage should or should not be employed. On the one side, there are those who advocate the “wet ” process, and on the other those who practise the “dry ” ; one flushes the peritoneal cavity with hot saline solution, while the other swabs away everything. Some prefer to drain under all conditions ; others close up the parietal wound completely. Both classes claim equally good results ; and that being so, the choice is an open one for every surgeon to adopt the method that appears most favourable to his own view of the matter. I own to being no particular partisan of any stereotyped procedure. Indeed, I think there are cases when one method is to be preferred to the other, and the best course to pursue is dictated by the surgeon's own common-sense judgment of what is most likely to attain the best result. Let me give an illustration of what I mean. Suppose the surgeon has a predilection for the “dry ” method, preferring to swab away all exudates, but he is confronted with a case in which the peritoneal cavity contains a quantity of extravasated material from the stomach as well as purulent exudates from the peritoneum ; I should consider the right course for him to pursue under such conditions

would be a liberal irrigation or flushing of the abdominal cavity with hot saline solution, and free drainage of the pelvic cavity and one or both loins. Not only should I deem it more likely that more of the exudates would be removed by this process, but such as would be left behind would be diluted, more readily absorbed and more rapidly excreted by the kidneys.

The objection raised to flushing, that it is likely by mechanical force to drive septic material into parts otherwise uncontaminated, may contain some truth in it ; but it is reasonably open to question whether such a result would be fraught with the danger supposed. As tending, however, to prevent such a possible contingency, it is wise to elevate the trunk when irrigating, so that all fluid would gravitate into the pelvic cavity, where it could be better drained off. There is no need to remove all the saline, since its presence in the peritoneal cavity probably aids in the increased secretion of the kidneys, which in itself is a beneficial factor in all septic processes.

In the after-treatment of these cases it is wise, if there has been marked evidence of peritonitis, to place the patient in the inclined position after operation, and to practise proctoclysis. Further, the stomach should be given as much rest as possible by administering all nourishment in the form of rectal enemata. Usually on the second or third day fluid food may be given by the mouth ; but discretion must be exercised in this respect, as in some bad cases it will be wiser to delay stomach feeding for a longer period.

As little morphia as possible should be given, and, indeed, in advanced and toxic cases it is wiser to withhold its administration altogether. Morphia tends to check secretion ; and what is most needed in these cases is a free and rapid removal of the toxic agents by the kidneys and the bowels. Flatulence, which is often a troublesome symptom, is to some extent relieved and removed by the frequent saline injections, which, being occasionally returned, bring away intestinal gases also.

The prognosis in these cases is usually favourable when the operation has been performed within a few hours of the perforation ; indeed, it might be said that the chances of a successful result are in direct proportion to shortness

of the time intervening between the operation and the perforation. As regards remote effects, a more reassuring prognosis is possible where the ulcer has been excised than where it has been simply invaginated or where a gastro-jejunosomy has been performed. Although the patient may not again suffer from the direct effects of the ulcer, it not infrequently happens that adhesions follow as an indirect result of the perforation and of the operation, so that symptoms sometimes arise due to these conditions. Patients who have suffered from one perforation have been known to be attacked by another, and even a third. An illustration of this rare triple sequence occurred in my own ward some years ago ; and still more interest attaches to the case because I again opened the abdomen for ominous symptoms of gastric ulcer, and found that perforation was on the point of taking place. A young woman was admitted on January 1, 1905, suffering from symptoms which were taken to indicate a perforated gastric ulcer. An exploratory operation, however, on this occasion failed to discover any rupture. She was admitted a second time on March 21, 1908, again with similar symptoms suggesting perforation. My assistant colleague, Mr. Farquhar Macrae, found a perforating ulcer on the anterior wall close to the pylorus. Later in the same year, on August 3, she re-entered the hospital for the third time, with symptoms equally typical of perforation. My colleague, Mr. Grant Andrew, on this occasion operated, and discovered a perforated ulcer on the posterior wall near the pylorus. Although no perforation was actually found at the operation for the first attack, the symptoms were so strongly suggestive of the event that it is quite possible it was in some situation posteriorly and had escaped notice ; it was probably, also, of that type which, by rapidly contracting adhesions to the tissues in immediate proximity, heals ; and so recovery ensues without the need of operation. When she entered the infirmary again on February 28, 1912, that is, about seven years after her first admission for symptoms of perforation, she was complaining of pain and vomiting after food. From these symptoms she had suffered for about nine weeks. The pain began about half an hour after ingestion and was acute in character, and extended across the epigastrium and through to the back. After the pain came on, vomiting

began, and lasted until the stomach had been emptied. The vomiting of the food always relieved the pain. Until fourteen days ago she had vomited nothing suggestive of blood ; but at that time she noticed that what she ejected looked like coffee-grounds. Physical examination of the abdomen was entirely negative ; neither tenderness existed anywhere nor could anything be felt. In view of what had previously happened, I did not hesitate to reopen the abdomen for the fourth time. On examining the stomach externally some puckering of the anterior wall of the stomach was noticed close to the lesser curvature, and on palpation of this a small mass could be detected. A digital examination from within revealed a small punched-out ulcer surrounded by indurated tissue. The usual no-loop method of posterior gastro-jejunostomy was performed, and then the ulcer was excised. The ulcer when examined afterwards was seen to be on the point of perforating. She made an uninterrupted recovery, and was relieved of all her gastric symptoms. Dare one say that another ulcer will not form ? Perhaps the gastro-jejunostomy performed on this occasion may have some preventive effect.

In view of the possibility of subsequent perforation, which, of course, really means the existence or formation of another lesion, any approach to hyperacidity in the patient's symptoms should be rigidly kept in abeyance by careful dieting and the administration of some such anti-acid as "milk of magnesia."

CHAPTER X

PYLORIC OBSTRUCTION

THERE is probably no class of cases for which surgery has done more in recent years than for that dependent on some obstruction to the normal outflow of the stomach contents into the duodenum. An obstruction mechanical in character could only be relieved by measures mechanical in application ; and so it was not until abdominal surgery became a practical and safe branch of the surgeon's sphere of labour

that patients so afflicted could be relieved of, in many if not most cases, a life of prolonged and continuous misery. This period of surgical progress really dates from the time when Wölfler in 1881 instituted the operation of gastro-jejunosomy. What we have learnt since then concerns both a better knowledge of the various causes which originate obstruction and better methods of dealing with them.

To properly understand, therefore, these causes is to adequately appreciate the various symptoms to which they give rise and the most suitable measures to adopt in their treatment. The causes of pyloric obstruction may be primarily classified as anatomical and pathological, and the latter may be subclassified into those dependent on inflammation and those the result of new growths.

I will discuss these causes in the order here given ; and first, therefore, I refer to the anatomical, consisting of a simple cause, which I think has as yet received only slight recognition, but which I trust I may be able to show plays no inconsiderable part in the group of conditions that obstruct the gastric outlet. It was at an early period of my work, when operating for obscure and intractable symptoms indicative of gastric derangements, that I, now and again, encountered a condition of the pyloric aperture which I was at a loss to explain on any other ground than that the opening was too narrow to allow of a free and easy exit of the gastric contents. That this was the source of the stomach trouble received further confirmation from the fact that relief and cure followed the operation of gastro-jejunosomy. After an experience of seven cases I read a paper before the Clinical Society of London entitled "Congenital Narrowness of the Pyloric Orifice a Cause of Chronic Gastric Disease in the Adult" (the Society's *Transactions*, vol. xxxvii, 1904, p. 63 ; and the *British Medical Journal*, vol. i, 1904, p. 417). This was added to subsequently by another paper published in the same journal (vol. ii, 1908, p. 71), in which twelve more illustrative cases were given. Dr. William Russell, of Edinburgh, likewise contributed an exhaustive discussion on the subject (*ibid.* p. 68), strongly supporting the view that such an anatomical condition existed and accounted for the symptoms met with in a certain class of cases.

Before describing the particular features peculiar to this form of obstruction I ought perhaps to state what may be considered the normal condition of the orifice as met with by the surgeon on the operation table. Under complete anæsthesia the gastric parietes are more or less flaccid. The pylorus externally presents a line of somewhat deeper colour than the neighbouring parts, and is marked by a convergence of vessels at its lower margin. Only the faintest constriction is, as a rule, visible, the duodenum often passing so imperceptibly into the stomach that it is only by the tactile sensation offered by the sphincter and the converging disposition of the vessels that the exact seat of the pylorus is determined.

There is no constancy in the amount of induration—if I may so express it—which the pylorus presents: a fact which seems to suggest that, although the patency of the canal may be quite normal, there may be great differences in the developmental condition of the sphincter—differences possibly dependent on the same physical causes which may naturally affect other parts of the body. I have little doubt that this variation has led to the difficulty experienced by some of determining whether the greater thickness met with in one case as compared with another was or was not due to some excessive hypertrophic or inflammatory cause. I am, however, convinced that the variation is quite normal, and may exist within considerable limits. Regarding the calibre of the pyloric orifice, I have always found that, while the index finger passes easily, it has conveyed to it the sense of a uniformly narrow, elastic ring which feebly embraces and rolls over the finger as it is gently pushed onwards. I should consider from 12 to 15 mm. the normal calibre during life and under relaxation (*see* Fig. 26). If one looks at a section of the pylorus—such, for instance, as given in “Quain’s Anatomy”—a sensation such as that above described is what might be reasonably expected. A uniform ring-like projection of mucous membrane is seen containing within its folds of reduplication circular bands of muscle-fibre.

When in my earlier cases I first met with this abnormally narrowed condition of the canal I was inclined to believe that, if not due to chronic spasm, it was the direct result of the introduction of the finger into the pyloric orifice:

that such a solid substance as the finger within the stomach was certainly likely to stimulate contraction of the pylorus, whose very function is to resist the passage of such indigestible objects as my finger presented. However, I had on one occasion when operating a very striking illustration of what the stomach and pylorus are like under contraction. I had the stomach partly withdrawn from the abdomen with the pylorus in view; the patient seemed somewhat suddenly to come out of the anæsthetic when an almost violent contraction of the gastric parietes took

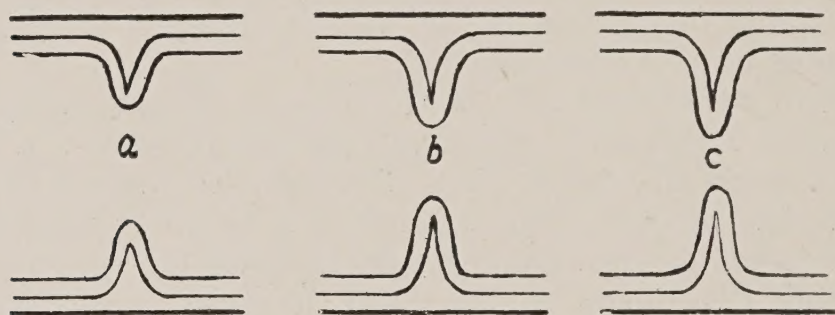


FIG. 26. Diagrammatic longitudinal section of pylorus. *a*, Normal diameter of pyloric orifice, 12–15 mm.; *b* and *c*, abnormal diameters, 7 and 3 mm.

place, causing a little of the clear fluid within the stomach to be forcibly spurted out. Immediately there followed contraction of the pylorus, which assumed the appearance of a rigid structure about two inches in length and about the circumference of the ring finger. Pressing the anæsthetic soon relaxed the parts; and it was under this relaxed state that I felt a narrow, uniform, ring-like constriction at the pyloric orifice incapable of admitting the apex of the index finger.

It was the information gained in the observation of this particular case that led me first to doubt that these narrowed orifices were spasmodic in character; rather that they owed their existence more to some abnormality in development than to any acquired cause.

As to the nature of this abnormality, I am inclined to regard it as due to an excess of reduplication of the pyloric fold, whereby the width of the valve is increased but the orifice correspondingly diminished; that it is, therefore, purely anatomical and congenital in origin. Such a defini-

tion entirely fits in with the facts revealed in the various cases met with ; for the obstruction was always perfectly uniform, and simply gave the impression that it was abnormally small, and the smaller it was the greater consequently the resistance it offered to the introduction and passage of the finger. Further, it should be emphasised that the resistance was in no sense like that encountered as the result of cicatrisation. That, as is well known, rarely gives way except with laceration ; while in the majority of these cases—the exceptions being those of a very high degree of narrowing—the “ring” gradually gives over to the advancing finger like an elastic band.

If I have been right, as I believe I have, in the construction which I have ventured to put forward regarding the nature of this narrowing of the aperture, then it is possible to conceive how we may have, solely as the result of development, any calibre of the pyloric orifice between that which we reckon as normal and that which will admit only a small-sized—say No. 6—ordinary urethral catheter.

I should say, before proceeding further, that, although ignorant of the fact when I first met with the condition that I have just described, subsequent investigation into the subject has brought to my notice the description of this same appearance of the parts by others. Landerer, quoted by Maier (*Virchow's Archiv*, Band cii, p. 413), seems to have been the first to draw attention to this simple narrowing of the pylorus unassociated with any marked thickening or other changes connected with the part. Maier similarly discusses this same congenital abnormality, and also indicates very clearly other appearances equally of congenital origin. Maier's cases numbered twenty-one, and were necropsies on patients who died mostly from other causes than those in any way associated with the gastric condition. In some a definite history of gastric trouble was known to have existed during life. While Maier's paper deals essentially with the anatomical and pathological conditions, it is also intended to indicate the clinical symptoms which may be present during life, and to suggest that due regard be had to their possible significance in this particular connection. For some years, therefore, the possibility of chronic gastric disturbance in the adult dependent on an abnormal narrowing of the

pylorus has been recognised ; but it is only comparatively recently, since surgery has attacked the stomach during life, that the cause and its effects have come to be more exactly noted and, still further, treated. The subject is briefly referred to by Mayo Robson and Moynihan in their work on " Diseases of the Stomach " (p. 42), a very typical case illustrative of the condition being described. The patient was a male, aged twenty-four years, who had suffered from indigestion for five years, which had commenced gradually and painlessly. When operated on, his symptoms were typically those of obstruction of the pylorus, and it was for this that he was treated. But the particularly simple and uniform nature of the obstruction, admitting only with difficulty the little finger, seemed to have led the authors to regard this case as one of congenital narrowing of the pyloric orifice.

If further support were needed to confirm the views above expressed, I think it is to be found in the unmistakable evidences generally acknowledged to exist in some other parts of the body of somewhat similar functions. Thus, there are distinct variations in the patency of the ileo-cæcal valve ; and William Mayo has reported cases that he has operated on where an abnormal narrowing of the passage between the ileum and the cæcum has been the cause of constipation—implying, therefore, as in the case of the pyloric aperture, that obstruction exists at the orifice (*Annals of Surgery*, vol. xxxii, p. 364). The uterine cervical canal affords yet another analogy, for the passage may be abnormally narrow, and prove obstructive to the easy and unimpeded flow of the menses. It is, perhaps, not overstretching the comparison to indicate the great differences that exist in the size of the oral aperture ; not that a small opening to the mouth is any impediment to the amount that may be introduced, only that it indicates that developmental variations so obviously exist that their presence in other regions is a perfectly reasonable assumption. I must not pursue this aspect of the subject any further, but it will be again alluded to when dealing with the question of symptoms ; for it is herein that this particular cause of pyloric obstruction will be found to play such an important part in the rôle of chronic gastric derangements.

The second primary class of obstructive agencies includes those cases of pathological origin which embrace, as indicated, causes arising both from inflammation and new growth, innocent and malignant. As occupying a somewhat dubious position must first be mentioned congenital hypertrophic stenosis. Although a condition most frequently met with in early life, it is not entirely confined to this period, as cases are occasionally encountered in the adult, and I have myself met with one unmistakable illustration. Maier, whose paper I have already referred to, fully established its existence in later life in some of the cases he describes. Others, too, in this country, among whom may be especially mentioned Clinton Dent and E. Cautley (*Transactions of the Royal Medical and Chirurgical Society*, London, vol. lxxxvi), have likewise confirmed the existence of this particular form of obstruction in the adult. I shall not attempt to discuss at any length the disputed question concerning the pathological origin and structure of the thickened pylorus. Its frequent disappearance in infants after careful attention to diet would seem to suggest that spasm, the result of irritation, plays some considerable part in the hyperplasia and hypertrophy of the muscle-coat which, in most cases, constitutes the principal factor in the thickening. On the other hand, the persistence of this thickening into adult life indicates something more than this; and the fact also that, in addition to increase of the muscle-tunic, there is often a good deal of cellular tissue developed in the submucous and intermuscular layers, renders it all the more probable that the origin of the condition depends on some congenital defect.

The account of one of my cases, the first, was reported in the *Lancet* (1904, vol. ii, p. 1709). It partook of the type described by Maier as "funnel-shaped" (*Trichterförmig*), the thickening of the pylorus gradually tapering off into the body of the stomach. The patient was a man aged thirty-one years, on whom a posterior gastro-jejunostomy was performed. He died nineteen months after operation from what was taken to be diabetes. A post-mortem afforded us the opportunity of examining the stomach. Dr. Anderson, the infirmary pathologist, gave the following report: "The pylorus was stenosed and rigid,

the aperture being sufficient to admit a No. 10 urethral catheter. The sections of the pylorus showed an atrophic appearance of the mucous membrane. The submucous coat was not hypertrophied. The muscular coat was well developed and hypertrophied, with areas of new formation of fibrous tissue between the muscular bundles. There were no evidences of healed ulceration nor of malignancy. Sections of several parts of the stomach wall were also prepared, and showed the results of a chronic gastritis. The mucous coat was atrophied with loss of glandular structure; the submucous coat was increased in thickness with fibrous tissue formation; and there was a slight fibrous tissue increase in the intermuscular layers, with no obvious increase in thickness of the muscular coat."

Spasm is often spoken of as a cause of gastrectasis and gastric detention. Except as a possible result of gastric ulcer, it is not usually regarded as an affection necessitating surgical intervention; for, if such a condition exist, it is probably of reflex origin, and therefore dependent on other causes, the successful treatment of which may be expected to relieve the spasm. Chronic and continuous muscular spasm can hardly be said to be a condition that we are familiar with in any other parts of the body; and, therefore, there would seem to be wanting reasons why we should regard it as a peculiar attribute of the pyloric sphincter.

I may introduce here a very remarkable and puzzling case—from a purely pathological aspect—which came under my observation for treatment a year ago. The patient was a man, aged forty-five years, who suffered from unmistakable symptoms of pyloric obstruction. On opening the abdomen, I discovered what I took to be a tumour of the pylorus; and believing it to be possibly carcinomatous in character, I excised the part. The specimen was sent to the pathologist, who reported that the supposed tumour was simply hypertrophied muscle. So like was the specimen to one of those described by Maier that I regarded it as a case of congenital hypertrophic stenosis in the adult. At the time there did not exist any marked indication of ulcer, or, at least, it was so lacking in prominence that it was overlooked; but after the specimen had been for some time in a preserva-

tive fluid, and the colour and plication of the mucous membrane had more or less disappeared, a very distinct ulcer was detected at the pyloric aperture. This discovery gave quite a fresh aspect to the possible true nature of the thickening. It was now a question whether the ulcer was an accidental association with a previously hypertrophied pylorus, or whether the constant irritation of a chronic ulcer had caused such a continuous spasm and contraction of the pylorus that it had led to the great muscular hypertrophy. It is so uncommon a sequel to an ulcer that I am tempted to regard the case as one of congenital hypertrophic stenosis; and that, quite possibly as the result of the stenosis, an ulcer had formed on the surface of the constricted pyloric aperture. It may be remarked that there was nothing in the way of cicatrization, external adhesions, or other signs of inflammation, so commonly associated with a chronic ulcer. The specimen was as clean and perfect as portrayed by the artist (*see* Frontispiece), who has faithfully depicted the appearance of the part as at present presented. If the slightest exaggeration exists anywhere, it is in the appearance of the ulcer, which, although becoming more distinct as time passed, was but faintly indicated shortly after the part was removed at operation.

If we are to accept the muscular hypertrophy as the direct result of the continuously stimulating effect of the ulcer, then we must allow that the possible reflex influences of an ulcer anywhere in the neighbourhood of the pylorus is a factor of no small moment in producing persistent contraction of the aperture: that, indeed, spasm of the pylorus is a very likely concomitant of chronic gastric or duodenal ulcer.

Of all the causes of pyloric obstruction, none exceed in frequency and extent those due to cicatrization, the normal sequel to ulceration. Very few cases are alike in the form which the obstruction takes. Sometimes the orifice is almost, if not entirely, encircled with cicatricial tissue, and this form produces the most extreme examples of stenosis. On the other hand, merely a fibrous band or ridge may be the source of obstruction; and it must be remembered that these bars to the progress of the contents of the stomach into the duodenum may be on one or other side of the

pylorus, the situation depending primarily on the original seat of the ulcer. Again, it is sometimes external adhesions more than the actual contraction of a cicatrised ulcer that causes obstruction, for, in this way, the pylorus may become distorted or kinked.

The variable phases of the pathological aspect of the subject all have their bearing on the multiple manifestations which the lesion may present. For, as will be later pointed out, it is the capacity or incapacity of the stomach to overcome the obstruction with ease or with difficulty that leads to the many complexities which so frequently complicate this particular class of cases.

The new growths which may cause obstruction are both malignant and innocent. The latter may be briefly dismissed with a few words. Innocent growths in the shape of polypi occurring on the inner surface of the stomach have occasionally been met with blocking the pyloric aperture like a ball-valve. External pressure is another rare cause of obstruction. By far the commonest form of new growth is carcinoma; but this will be dealt with later when discussing malignant disease of the stomach.

Coming now to the symptoms of pyloric obstruction, it will simplify matters very materially if we first consider what are likely to be the natural physiological and pathological sequences to any hindrance to the escape of the contents of the stomach into the duodenum. And here let me remark that I do not intend to continue the discussion into a consideration of those advanced cases in which there is no difficulty in diagnosis—where, for instance, we have all the signs of a stomach that occupies a considerable portion of the abdomen, holds several pints of fluid, and retains so much of the food taken that the patient occasionally vomits a “basinful” or “chamber-potful” of sour, undigested, “porridge-like” material containing fragments of food probably taken the day before. What I particularly wish to draw attention to are those cases where the stomach is still capable of overcoming the obstruction, though with variable degrees of success. For want of a better and more accurate term to apply to these cases, we may designate them cases of partial pyloric obstruction. So difficult are they sometimes to diagnose and so diverse in their manifestations that I once selected the subject for an address,

entitling it "The Symptomatic Vagaries of Partial Pyloric Obstruction" (*Lancet*, vol. i, 1901, p. 1194). Many of the following remarks are taken from that address.

If one considers the physiological effects of an obstruction at the gastric outlet—and by this must be understood that not only the pylorus itself but the parts of the canal immediately in front and behind it are included—it will be clear that the organ first to be affected by the barrier will be the stomach itself. Whatever be the relative importance of the different functions of the stomach, it is certain that nothing can take the place of the motor function; and the contents of the stomach, however much they may be acted upon, whether sufficiently or insufficiently, by the gastric juices, must be propelled out of the viscus by the contraction of the muscle tunics. Thus, then, it may be reasonably assumed that the primary effect of obstruction will be to place increased work upon the muscle layers; and the amount of work which they are called upon to perform will be in direct proportion to the amount of obstruction they have to overcome. It is more than likely that the increased pressure to which the contents of the stomach are subjected, in the greater effort of the organ to rid itself of its digested ingesta, may deleteriously affect the normal secretion of the gastric juice both quantitatively and qualitatively. But, however this may be—and possibly it is only a factor of moment in cases of considerable and prolonged obstruction—it is the effect upon the muscle-tunic that determines the interesting symptomatic vagaries of the condition, and, therefore, the factor deserving of most attention.

Consider for a moment the parallel illustration of any voluntary muscle of the body which is called upon to undergo prolonged exertion. If the exercises or work to be done be of an intermittent type, the periods of rest and increased requirements lead to a compensatory development, which, up to a certain pitch, succeeds in always accomplishing the ends required. If, however, there be no periods of rest interposed weariness supervenes, and an entire failure of accomplishment ensues. Introduce another factor into the scheme, fail to supply the body with proper or sufficient nourishment, and muscular inertia will be rapidly experienced.

The stomach does for a time, and that in direct proportion to the amount of obstruction it has to overcome, succeed in carrying out its normal functions. Its muscular tunic hypertrophies, and it continues to drive out its contents successfully; but as time goes on it becomes more and more susceptible to influences which may reach it either by way of the nerve system or the blood-supply. Thus, causes of various kinds which arise from nerve exhaustion or imperfect or improper metabolism affecting the constitution as a whole, influence the struggling stomach in particular. Muscle inertia ensues; and instead of the viscus propelling its contents through the obstructed orifice, the latter remains, only in part it may be, pent up in the gastric cavity, awaiting the time when the muscle parietes shall have regained sufficient energy to effect total ejection. The sequence of events, however, may not prove so simple as thus far they may appear. For when, for the reasons given, the stomach is unable to expel its contents, it may, through sheer weariness of effort, relax its endeavour and give way to passive dilatation. To what extent this may go and how long it may last will depend on the nature and degree of the obstruction and the general physical state of the patient. Herein will be seen to enter the symptomatic vagaries of the disease; for there is no telling when the symptoms will subside, exactly why they should appear, nor why they are of the nature manifested. And yet, taking these considerations collectively, they furnish the best clues to the nature of the complaint.

Let me now reverse the picture; depart from what might be termed the text-book style of describing the disease, and approach it from the purely clinical aspect, that aspect of it which we encounter in our practical daily life. And I cannot do this better than by introducing a few typical cases.

I received a letter from a doctor in the country stating that he had a man under his care, aged thirty years, who was seized periodically with attacks of epigastric pain, occurring every few months, but varying in severity and duration, lasting from two or three to ten days at a time. These attacks had been more recently coming on at gradually lessening intervals. His doctor said he had

reason to believe that the symptoms were gastric in origin, for he had been able to elicit evidences of dilatation of the stomach. He asked me to take him under my care. Owing to there being no vacant beds in my ward at the time, some weeks elapsed before he was written for. It was then ascertained that he had gone for a holiday. Later I received a second letter from his doctor saying that the patient had returned from his holiday : that he had so greatly improved as to be free entirely of all gastric symptoms. His doctor asked me, in the light of that report, what was my opinion of his case, and what would I advise. I based my reply on experience I had already derived from the past histories of cases of partial pyloric obstruction : that if the patient were suffering from such a condition he would, as soon as he returned to his ordinary mode of living and customary work, have a recurrence of his symptoms. It was not long after that, that I again received a letter from his doctor saying that the man had a return of all his old symptoms. He was, accordingly, admitted to the infirmary. His condition on admission was that of a man in good health ; he was well nourished and had no complaint, except occasional attacks of severe epigastric pain. Physical examination of the abdomen revealed some tenderness of the skin and resistance to pressure in the epigastric region, but there were no evidences of gastric dilatation. If careful with his food, he did not suffer any discomfort. In going into the history of his case, it was ascertained that his illness commenced about three years previously, and at that time his doctor believed him to be suffering from duodenal ulcer. There is no need to go further into the clinical details of his case ; it was sufficiently clear that the man had partial obstruction at or about the pyloric orifice, and that this was in all probability due to adhesions or cicatricial contractions the result of an ulcer still active or healed. The operation proved the correctness of the diagnosis ; and the performance of a gastro-jejunostomy afforded complete and permanent relief.

Another case I should like to relate, because, though similar in most respects, it differed in other ways of instructive interest. The patient was a man, aged fifty years, whose doctor wrote to me and said that he believed he was suffering from pyloric obstruction. He detected at

certain times well-marked succussion. Owing to considerable pressure at that time on the accommodation of my male ward, the patient could not be admitted, so that some time elapsed before he was sent for. But, when he did receive intimation that a bed would be ready for him on a specified date, he replied that rest and treatment had so improved his condition that, after all, he thought it would not be necessary for him to enter the infirmary. He accordingly returned to his work and his usual mode of living. However, it was not long before I received a letter from his doctor saying that his patient was as bad as ever, and would I take him in as soon as possible. He was, therefore, admitted, when we obtained the following history of his illness: Up to five years ago he had enjoyed perfect health, but at that time he was seized with fairly severe pain in the epigastrium. This pain radiated to both sides, to the back, and sometimes to the right shoulder, which he stated he could relieve by rubbing. The pain did not come on until some time after a meal, and he could obtain relief by taking something more to eat. He was constipated during this attack, and noticed that his stools were like tar. His illness lasted for four weeks. He recovered completely, but a second and similar attack seized him a year later at the same period in the spring. For three successive springs he suffered much in the same way, but indigestion became a more marked feature. Flatulence and eructations of a very sour nature, which seemed to scald his throat, were troublesome symptoms. Vomiting also became frequent, and he soon found that if he did not empty the contents of his stomach he would not get relief of the pain. During the past year the recurrence of his gastric symptoms had become much more frequent, and he had been obviously losing weight. On admission to the infirmary he had all the appearance of a healthy, well-nourished man. There was seen gastric peristalsis, but, further than this, there were no evidences of gastric dilatation. Some of the vomited material showed the presence of *sarcinæ*. I need not lengthen the clinical aspect of the case. As in the previous case narrated, the symptoms pointed to a partial contraction of the pylorus, the result of a healed duodenal ulcer, and to the need of operating. At the operation the pylorus was found fixed under the lobe of the liver, and just beyond

was a thickened mass apparently embracing the whole bowel. Gastro-jejunostomy was performed, and the patient made a good recovery.

These two cases illustrate organic lesions the result of a pathological process; but I should like to give an example of partial obstruction due to the developmental defect to which I have already alluded at some length—congenital narrowness of the pyloric aperture; it, of all forms of pyloric obstruction, seems to present the most striking symptomatic vagaries. No two cases can ever be said to be exactly alike. In the case I am about to briefly narrate, the patient was a female aged thirty-seven years. She had for several years suffered from what she described as a “weak stomach.” She sometimes remained quite free from symptoms for several months, but with any indiscretion of diet she would have an attack of indigestion coupled with pain and sometimes vomiting. Her appetite was good and her bowels regular. As her attacks of indigestion were becoming more frequent, she sought admission to hospital. At this time her stomach had become so intolerant of food that she was living on slops. On admission there were marked evidences of dilatation. The stomach, when artificially distended with gas, reached to two inches below the umbilicus; there was succussion, and, at one time, it was thought peristalsis was seen. *Sarcinæ* were obtained from one of the “wash-outs.” At the operation a uniformly narrowed pyloric aperture was felt, the index finger being unable to enter the orifice. There were no evidences of ulceration or cicatrisation. Posterior gastro-jejunostomy was performed. The patient when seen, more than two years after, was taking ordinary food, and free of all gastric symptoms.

It would be easy for me to give other illustrative cases; but these, I think, are sufficiently typical to bring out the salient features under discussion. And now I would ask for more particular attention to what these salient features are.

(1) In the first place, there is about the general appearance of the patients usually nothing to suggest a constitutional disease; in other words, the gastric symptoms appear to be dependent solely on disturbances affecting the viscus itself; indeed, there is often an appearance of

health and robustness about them, and between their attacks they are quite well. In those cases where the patients are thin, it is not the thinness suggestive of a constitutional disease, but simply an emaciation due to lack of sufficient nourishment.

(2) When a careful examination is made into the initial symptoms of the case, it will be found, in not a few instances, that the patient had suffered from some more or less acute seizure suggestive of ulceration; that is to say, there had been acute epigastric pain coming on some hours after food, and perhaps relieved by taking more food, followed, it might be, by vomiting blood or the passage of blood in the form of "tarry" stools. But it is by no means uncommon to meet with cases where no such suggestive symptoms previously presented themselves; indeed, nothing more may be elicited than that, for some inexplicable reason, the patient began gradually to find that certain foods disagreed, and that he had to be increasingly cautious both as regards the quantity and quality of the nourishment taken. Without such precautions he became conscious of a sense of weight in the epigastrium, and sometimes of pain; and relief was at once obtained by removing the contents of his stomach either by making himself vomit or by using the stomach tube. While this is the kind of history sometimes obtained in cases of ulceration with cicatrisation or formation of external adhesions, it is usually that elicited in cases of congenital narrowness of the pyloric aperture.

(3) Another cause of the exacerbation of the symptoms is found in anything that has an enfeebling effect upon the constitution as a whole. If, from undue exertion, mentally or bodily, from worry or over-anxiety, the patient is reduced to a state below par, the same diminished sense of physical and physiological fitness is felt by the stomach, which thereby becomes less capable of overcoming the difficulties it will have already been called upon to encounter in a partially obstructed pyloric aperture.

(4) It will nearly always be noted that while at the outset the attacks are few and far between, they gradually increase in frequency, and as they become more frequent so they become more severe. At first a little attention to diet for a day or so may put matters right, but a time comes, sooner

or later, when the patient finds it necessary to vomit if relief is to be obtained. This sequence of events is most suggestive, because it indicates two probabilities—one, an increasing narrowness of the pyloric aperture, and the other, that the stomach is beginning to fail in its power to overcome the obstruction. The patient, further, begins to note that the attacks are in some instances dependent on the nature of the food taken. There is the greatest possible variety in the kinds of foods which different patients can tolerate; but, sooner or later, as the orifice becomes narrower and more constricted, or the stomach enfeebled in its power of propulsion, the food has to partake of the nature of a fluid, or what is considered of an easily digestible character. These are significant features in the case, and useful from a diagnostic point of view; because it is sometimes possible to make still further certain of their clinical value by actually evoking them at will by giving a liberal normal diet.

(5) Considering, now, local manifestations, such as are obtained by a physical examination of the stomach, both from within and without, it will be found that considerable differences exist in patients, and in the same patient at different times. These differences, indeed, may be said to constitute some of the principal symptomatic vagaries of the condition under discussion. We may have marked evidence of a dilated stomach at one time, distinct gastric peristalsis at another, and at another there may not be the slightest evidences of the existence of such signs. The reason for these irregular manifestations is such as I have already indicated at an earlier period of my remarks. When the evidences are negative, it is that the stomach is successfully overcoming the obstruction; and when positive, it is that, for the time being, the effort is exaggerated and peristalsis is visible, or it has failed and dilatation results. Therefore, as in the two cases narrated, both doctors detected dilatation when the patients had an "attack," but when they had recovered, as at the time of entrance into hospital, no dilatation was found to exist.

In considering this condition of dilatation, it should be noted that, until very advanced stages of the complaint, the dilatation is never extensive nor prolonged. A little rest and attention to diet usually causes it to disappear.

In this particular respect, therefore, this class of cases differs very markedly from that where there is, for the time being, complete obstruction owing to some special peculiarity about the nature of the lesion and its relation to the stomach.

Under the title of "Intermittent Pyloric Obstruction," Dr. T. R. Bradshaw, of Liverpool," in an address (*Lancet*, vol. ii, 1910, p. 537) referred to two cases, and to another of Sir William Broadbent's quoted by Sir Clifford Allbutt ("System of Medicine," vol. iii, 2nd edit., p. 535), where, owing to the existence of adhesions, an altered position of the stomach led to a complete obstruction of the pyloric orifice. The symptoms under such circumstances were of necessity severe and exaggerated, and could not fail to suggest the true nature of the complaint. It is quite possible, however, that these cases should be really regarded as only advanced and exceptional instances of those about which the foregoing remarks specially deal; for one may fairly assume that, before the accident of complete obstruction ensued, there had been gastric attacks indicative of partial obstruction, recovery from which usually followed the taking of certain precautions. Coming under this particular class, and yet partaking much, if not more, of the one under discussion, I may briefly refer to the following case. The patient was sent to me suffering from dyspepsia of a chronic and intermittent type, with occasional evidences of dilatation of the stomach. She was a particularly healthy-looking woman aged thirty-one years. Her symptoms began about twelve years before with attacks of indigestion represented by flatulence, eructations, a sense of fullness and weight in the epigastrium after food, and occasional attacks of pain. The pain was usually felt about two hours after food, and she discovered that she was relieved if she, at such times, took food. Within the last few months her symptoms had considerably increased, pain being felt not only in the epigastrium, but in her side, back, and upper part of the left arm. The most striking feature about her case was, however, that if she lay down after taking a meal she suffered but little, whereas getting about her ordinary work always caused severe attacks of indigestion. On admission to hospital there were distinct evidences of dilatation of the stomach. She

was given a test meal, and ordered to remain in bed. The "wash-out" six hours after was perfectly clear. The same meal was given, and the patient allowed to be up and about; and when the stomach was washed out, after the same interval of time, a copious residue existed. At the operation there were external evidences of thickening and cicatrization about the pylorus; and when the finger was introduced for examination of the aperture, marked induration was felt at the anterior and lower part of the orifice. The orifice itself was much narrowed, so that the index finger could only with force be driven through. A posterior gastro-jejunostomy was performed, and the patient made a good recovery.

This case presents a very striking resemblance to that of Sir William Broadbent's already referred to. In that case the patient, when retiring to rest, was conscious of the escape of the gastric contents into the intestine, and the disappearance of all gastric symptoms; in the erect position, all the evidences of gastrectasis with retention were marked. At the post-mortem a non-malignant, non-stenotic thickening of the pylorus was found. This during life did not apparently cause stenosis except when the patient was in the erect position, and then did so by inducing an acute flexion at the part at the point of suspension.

(6) Other evidences of partial obstruction are to be found in the nature of the contents of the stomach as determined after removal. Thus, it frequently happens that though the patient in the interval of the attacks has but little to complain of, nevertheless, if the stomach be washed out, say, six hours after a test meal, a certain amount of material, digested and undigested, is present as a residuum. This unmistakably indicates that the stomach is not completely emptying itself, as it would otherwise do in the time if no obstruction existed. Furthermore, the presence of fermentation products, such as lactic acid, and the detection of *sarcinæ*, attest to a similar cause.

If, in conclusion, I were to express in the briefest possible way what, I consider, are the points of most significance in partial pyloric obstruction, I should say: intermittent attacks of dyspepsia, coupled at such times with the

physical signs of gastric peristalsis or gastrectasis in often otherwise healthy patients.

In dealing with the subject of radical treatment as opposed to the employment of purely palliative measures, the principle to be carried out in all cases is the same ; that is to say, we have to overcome the obstruction, and to secure an unimpeded exit of the stomach contents into the intestine. But the practices to be adopted in carrying out this principle vary. Each case has to be considered on its merits. Thus, suppose we have reason to believe that the obstruction is in some way due to external adhesions, the separation of these may be all that is required (gastrolysis). But, in order to feel assured that nothing further is required, we must be satisfied that the adhesions will not re-form and the obstructive symptoms return. This constitutes the chief difficulty in dealing with this particular class of cases ; and if there is any doubt in the matter it is wiser to add a further precaution in the way of performing a gastro-jejunostomy.

When the obstruction is intramural, several courses are open to us. We may enlarge the constricted orifice by forcible dilatation (pylorodiosis). This method, however, may now be regarded as obsolete. It was invariably found that recontraction took place sooner or later, with consequently a recurrence of the symptoms. Much the same reason is given for discarding the operation of pyloroplasty. It has happened to me, as I believe it has to most surgeons who have practised this operation, that it has been found necessary subsequently to perform gastro-jejunostomy. Nor is the operation altogether free from danger, from the fact that the strain put upon some of the stitches uniting the edges of the wound transversely is apt to make them cut through before a sufficiently secure line of union is effected, with the consequence that leakage takes place.

We are, thus, reduced to the three alternatives of gastro-duodenostomy, Finney's modification of the same operation, and gastro-jejunostomy. The first of these three—the establishment of an anastomosis between the stomach below the pylorus and the first part of the duodenum—has practically given place to Finney's method of executing the same operation. Finney cuts through the pyloric aperture, and so throws it into the new opening. It is

unquestionably the ideal operation, because it directly deals with the seat of obstruction, and so admits of the stomach fulfilling its normal function, which is to drive its contents through the pylorus. It cannot, however, always be performed; for its successful execution rests on the possibility of the involved parts being sufficiently liberated and brought into easy access for effectually and securely establishing the union of the stomach with the duodenum. The cases for which it is best suited are those where the orifice is simply and uniformly narrowed; as illustrated, for instance, in that class of cases to which I have given the name of "Congenital narrowness of the pyloric orifice." Finney, in his instructions regarding the operation, emphasises the importance of freely mobilising the pylorus in order to render the parts more accessible. It is doubtful, however, if this should be carried out to the extent of weakening the natural suspension of the pylorus and first part of the duodenum. When, therefore, as the result of fixity of the parts, or of the cicatricial tissues and thickening of the involved region, Finney's operation is not possible, the no-loop operation of posterior gastro-jejunostomy should be performed, and the opening made as close as possible to the pylorus.

Hour-glass Contraction of the Stomach.. As hour-glass contraction of the stomach has much that may be considered in common with stenosis of the pylorus, this would seem the proper and most suitable place to introduce a few remarks on the subject.

Whether this condition can ever be regarded as a congenital defect, or whether it is always to be considered a consequence of cicatrisation the result of ulceration, I do not intend to discuss. But whatever its cause, it is by no means an infrequent occurrence; and no surgeon who has had much experience in gastric surgery will have failed, now and again, to have met with a case. If the mind is kept open in regard to its possible occurrence, it will sometimes be diagnosed beforehand; but I think it is more frequently encountered when unexpected.

As a clinical fact of no little practical importance is the occasional association of the contraction with stenosis of the pylorus. Many years ago I was caught in this way, and was puzzled to know why my gastro-jejunostomy failed

to relieve the symptoms. Unfortunately, it was the post-mortem that revealed the unpleasant fact that, while I had quite successfully dealt with the hour-glass contraction, I had left a cicatricially contracted pylorus which effectually prevented the stomach emptying itself. It was a lesson well learnt ; for not long after I encountered a similar case, and avoided committing a like mistake by performing a gastro-jejunostomy on the proximal side of the hour-glass contraction. The pyloric aperture, therefore, should always be examined in these cases. As further suggesting constriction of the pylorus is the frequently dilated state of the stomach distal to the hour-glass contraction—a condition which it would be quite impossible to explain except on the ground that there was obstruction to the outlet of such material as was able to pass through the narrow communication in the body of the stomach.

In the treatment of hour-glass contraction, uncomplicated with pyloric stenosis, gastro-gastrostomy proves a perfectly satisfactory operation. The opening should be made as large as possible ; and if Finney's method of performing gastro-duodenostomy can be applied to the stomach, the contracted opening should be included in the new communication.

When pyloric stenosis is associated with the hour-glass contraction, gastro-jejunostomy—short-circuiting the part of the stomach proximal to the contraction—should be coupled with gastro-gastrostomy. But for the performance of the latter operation, there would be the liability of retention of material in the portion of the stomach distal to the hour-glass contraction.

CHAPTER XI

GASTRIC CARCINOMA AND SARCOMA

CARCINOMA of the stomach presents us with problems as difficult to solve and practices as hard to execute as any with which we may be confronted in malignant disease

situated in other parts of the body. The truth of this statement will be fully substantiated when it is pointed out that a patient may be suddenly carried off by an accident incidental to unsuspected advanced disease of the viscus, and that a small local lesion may be accompanied with widespread and remote metastasis. Thus, the problem of diagnosis is difficult, and the practice of total extirpation of the disease equally so.

Carcinoma of the stomach, in the many questions which it raises, differs in no way from that of the same disease when it attacks other organs of the body ; that is to say, we want, for instance, to diagnose the condition as soon after its initial appearance as possible, and we want to attempt its removal at an equally early stage. To accomplish the one would very materially add to the ease and success with which we should be able to execute the other.

As far as our knowledge at present goes, we are absolutely without data, or at least differential data, that would enable us to state that certain dyspeptic symptoms were the result of an early carcinoma. Almost without exception, these early signs are merely part of a group that arise in connection with other gastric derangements ; and if our suspicions are to be aroused, it will not be by any special features which these symptoms present, but by their occurrence at such times and under such circumstances as render their explanation difficult except under the assumption that they are the result probably of malignant disease. Thus, dyspeptic symptoms arising after middle age, and more particularly after the fifth decade, in patients who have never suffered from gastric symptoms previously, and who, at the time, cannot offer any reasonable cause for the onset of the symptoms, should always be regarded with suspicion ; and if medicinal and dietetic treatment only leads to temporary improvement, still greater anxiety may be entertained regarding the probable malignant character of the lesion.

As the disease advances a series of symptoms of a much more distinctive and significant type arise. Not only will the strictly local symptoms become more manifest—such as pain after food variable both in character and position, vomiting, flatulence, and other indications of gastric derangements—but the patient loses appetite, wastes,

grows weaker in strength, and becomes anæmic. Added to these suggestive signs are those derived from a physical examination of the patient. Tenderness may exist on pressure in the epigastric or hypochondriac regions; a tumour may sometimes be detected. When we come to examine the stomach contents we may find evidences of food retention and of imperfect digestion of the ingesta. Sarcinæ may be discovered, and sometimes the long, non-motile, bat-shaped Oppler-Boas bacillus may be found. A "test breakfast" sometimes reveals the absence of free hydrochloric acid, or, what is considered by some of more significance, the diminution of combined or protein hydrochloric acid.

Unfortunately, not one of these symptoms can be considered pathognomonic; it is only when taken collectively that any importance of clinical value can be attached to them; and the absence of any one or all is not inconsistent with even advanced carcinomatous invasion of the viscus. As illustrative of some of the vagaries of this disease, mention has already been made of a case which some years ago I had under my care, where the patient was admitted to hospital for treatment of a peritoneal fistula. He died suddenly, from what the post-mortem revealed to be, a perforation of a large malignant ulcer of the stomach. During his residence in the ward not the slightest suspicion was ever aroused regarding any gastric derangement. And such cases are by no means uncommon in the practice of those who see much abdominal work, or who are engaged in the pathological department.

It will thus be seen that carcinoma of the stomach presents us with not a few problems for solution, and among the most cogent are those which concern the question of early diagnosis. At present our only hope lies in an exploratory operation carried out when our suspicions are first aroused. In view of the good which would, with almost certainty, follow the removal of the disease in its initial stages, the performance of an exploratory laparotomy, even if it revealed an error of judgment, must be considered a matter of very minor gravity. If we wait till the manifestations of the disease are such as to admit of little doubt in diagnosis, then, in the large majority of cases, we shall have waited until either operation is impos-

sible or, if attempted, temporary relief and not cure can be the only result.

Among some of the most interesting vagaries of carcinoma of the stomach are those connected with the histological type of the disease and its seat in the organ. In structure, the commonest type met with is the cylinder-celled, but occasionally the spheroidal-celled is encountered. Both types may undergo colloid changes. The puzzling feature about the lesion, be it of any type, is why it should in some cases remain so localised and in others show such extraordinary proclivity to disseminate. Cases occasionally occur in which the lesion is a comparatively small focus, while the metastasis in the liver is so great that it entirely masks the primary seat of the disease. Should the growth be in the neighbourhood of the pylorus, symptoms of obstruction will result; the stomach dilates, and the patient suffers from all those symptoms with which we are familiar in the case of pyloric stenosis from cicatricial contraction.

As the result of necrosis, which is not an infrequent sequel to the progress of cancerous ulceration, perforation may take place into the peritoneal cavity, or an artery may be opened into; occasionally the lesion becomes infected with pyogenic organisms, and an abscess may result. In one of my own cases, the abscess pointed in the epigastrium; and when opened gave rise to a most foetid discharge and a constant escape of the stomach contents, so that the patient soon succumbed.

One of the most remarkable instances of gastric carcinoma which ever came under my observation occurred in my hospital practice some years ago. It presents a particularly rare phase of the disease, and one which, I think, renders it well worth relating. It was a case of carcinoma of the pylorus, principally causing enormous dilatation of the stomach. The patient had intestinal obstruction, and it was thought that this was possibly due to a malignant stricture in the colon. The case, however, is so interesting that I am tempted to give it at some length.

The patient was a man aged sixty-six years. He stated that up to two years ago he had enjoyed good health, but at this time he began to lose his appetite, was conscious of a sense of oppression and fullness in the stomach, and

suffered from pyrosis. Under treatment these symptoms disappeared. He then continued to take his food as before, and remained actively engaged in his work until three weeks ago, when his bowels commenced to be very costive, and he was conscious of distension and gurgling in his abdomen. As the difficulty in getting the bowels to move increased, he used enemata, and thereby effected the discharge of some "little round balls." Neither blood nor mucus was seen. He had had no crampy or acute pains in the abdomen, but merely a sense of great discomfort from extreme distension. He had also noticed internal movements, evidently peristaltic. Position seemed to have some effect on his symptoms. When he lay on his left side they were increased, but diminished when he sat up, as he was then able to belch up some gas. He had not vomited, but pyrosis had been a frequent symptom. He was conscious that he was losing flesh. It was three days before the patient was admitted to the hospital that I saw him in his own house. In his general condition he was remarkably cheery; and except that he was pale and somewhat emaciated, he in no way looked like a man suffering from advanced malignant disease. His chief complaint was abdominal discomfort from inability to obtain a movement of his bowels.

On admission to the hospital he was noticed to be in a poorly nourished condition. His face was pinched and drawn in expression. His tongue was coated with a dirty, viscid fur; and the teeth were in a bad condition. His temperature was 97.6° F. and his pulse 96. He complained of no pain, but only of an uncomfortable sense of distension. On examination of the abdomen there was seen to be very marked bulging both in front and laterally, although it was more marked in the left iliac region. No peristalsis was observed; abdominal respiration was diminished. To percussion, there was a tympanitic note in the epigastrium, becoming dull down towards the iliac regions and the flanks; and there appeared to be a slight shifting with change of position. A suspicion of fluctuation seemed present in the epigastrium. By palpation, splashing was detected in the epigastrium; and resistance and tenderness existed in the left iliac region, where slight gurgling was heard. The area of liver dullness was diminished. Neither

the heart nor the lungs presented anything abnormal. The urine was normal. During the three hours that elapsed between his admission and the operation, he did not actually vomit, but seemed to cough up a little dark fluid. A two-pint enema which was given returned with flatus and a few small round black scybalæ.

The abdomen was opened by an incision in the left flank. The intestine was seen collapsed and pressed down by what appeared to be a large tense cyst. A second incision was then made in the abdomen in the middle line, when a bluish, thin-walled cyst, with blood-vessels stretched over its surface, at once presented. It was punctured, and ink-like fluid, sour to the smell and containing whitish masses of solid matter, spouted out with considerable force. Eleven pints of this fluid were drawn off; and it was then discovered that the supposed cyst was the stomach, which rapidly contracted down and presented the normal appearance of muscle parietes. The vessels also, which had spread over the apparent cyst, were seen to be the normal branches proceeding from the two curvatures. On further examination a mass of scirrhus was found involving the lesser curvature and anterior surface of the stomach towards its pyloric end. Nodules were also found scattered freely throughout the mesentery and omentum. The stomach wound was stitched up, and both the abdominal incisions closed.

He was greatly relieved by the operation; and the next morning was reading the daily paper with very little concern about himself, and feeling comparatively comfortable. In the afternoon, however, the distension commenced again, and on the following day the abdomen was so swollen that the stomach tube had to be passed. By this means a quantity of fluid, similar to that removed at the operation, was withdrawn. The washing-out was continued on the succeeding days, as much relief seemed to be afforded by it. On the evening of the fourth day he still seemed quite comfortable, but shortly before 2 A.M. on the morning of the fifth day he suddenly collapsed and died. A post-mortem was conducted by Dr. John Anderson, the hospital pathologist, who reported as follows on the condition of the stomach: "The stomach is greatly dilated and its wall remarkably thin, so that without very gentle manipulation

it is easily torn. The cavity contains a quantity of dark grumous fluid. A malignant stricture exists at the pylorus, of the concentric type; it extends along the anterior wall and lesser curvature for about two inches, causing the wall itself to be about three-quarters of an inch in thickness. An area of ulceration exists on the posterior surface of the growth. The tumour tissue is more evident on the anterior wall; the lumen of the pyloric aperture is still of fair size, admitting the passage of the finger." The liver contained no secondary nodules, and there was nothing of note in the other organs or tissues.

In reviewing this case, perhaps the feature of most striking interest, among the many perplexing problems which it presented, was the extreme paucity of symptoms, and their apparent want of gravity when considered in relation to the serious nature and extent of the disease. There was one very prominent fact, however, about the patient that served to mask what might have been much more in evidence and suggestive, and that was his possession of a remarkable buoyant nervous system. He made light of such symptoms as he had, and doubtlessly disregarded others that might have proved diagnostically useful. He never once took a gloomy view of his case, and always regarded his condition as merely transitory. As stated, he was reading the newspaper the morning after the operation; and was often making jokes with the nurses and the resident assistant. Attention is specially drawn to this particular aspect of his case, because, as already stated, it admits of the reasonable assumption that he probably belittled many of the early symptoms, which, in a patient of less optimistic and cheerful nature, might have shown that an organic complaint of the stomach had been in existence for some time.

The absence of vomiting was somewhat remarkable, and must, I think, be explained on the ground that the hyperdistension had completely paralysed the gastric parietes. It had become little more than a flaccid sac, with walls so thin that they must have very nearly reached the bursting-point.

Believing the case to be one probably of obstruction in the large bowel, I opened in the left iliac region, deeming it likely that such enormous distension of the colon would

hardly take place unless the obstruction was seated low down in the large intestine. It was with a sense of considerable surprise that I found the bowel collapsed, and apparently so, as the result of the pressure of a very tense cyst. As the report of the case goes on to state, I then opened the abdomen in the middle line, and my remark was that had the patient been a female, and not a male, I should have thought that I had an ovarian cyst to deal with. The true nature of the swelling, however, at once became evident on letting out the fluid, for the sour smell and the coagulated lumps of what were evidently the result of ingested milk revealed the fact that it was the stomach that had been opened. This became still more conclusive as the muscle parietes of the viscus contracted, and the vessels, which we so stretched over its surface, were seen to be the normal branches extending over the anterior surface of the organ from the greater and lesser curvatures. As gastric obstructive symptoms had never been a feature, apparently, in the history of the case, I thought it quite possible that, having relieved the great distension, the pyloric aperture might become sufficiently permeable. I did not, therefore, perform gastro-jejunostomy; and, still further, the marked evidence of widespread malignant disease did not render such a proceeding worth undertaking in view of the above possible competency of the pyloric passage. The nature of the fluid was somewhat striking. In appearance it was like ink; it was probably gastric secretion mixed with blood. From the large quantity removed at the operation—eleven pints—and subsequently, it hardly seemed possible to believe that it consisted solely of altered blood, but that the major part of the fluid must have consisted of an excessive gastric secretion, for at no period did the patient appear to be suffering from any great loss of blood.

Reverting to the general subject of treatment of carcinoma of the stomach, we have to act on the same principles that guide us in the surgical treatment of carcinoma in any other part of the body: we want to remove the whole disease, root and stock. To do this we must adopt a similar practice to that which we employ, for instance, in carcinoma of the breast. We must remove the local lesion together with the glands and lymphatics, which

are the means of conveying and distributing the germs of the disease to more remote parts. The lymphatics of the stomach course along the lesser curvature toward the cardiac orifice, and those along the greater curvature toward the pylorus. In both these curvatures are situated numerous lymphatic glands. The dome of the viscus is the part freest from lymphatic distribution. Hence it follows that if we are to make the same endeavour at extirpation as we do in the case of carcinoma of the breast, we must remove the pylorus with the greater part of the stomach in every case, no matter where the disease is situated. The old operation of pylorotomy must be replaced by that of partial or sub-total gastrectomy. When, therefore, we can get our cases early and remove the greater part of the organ, we may hope to effect a perfect and permanent cure. But how rarely we at present succeed in obtaining the one, and therefore in accomplishing the other. My own experience is that I see more cases that are inoperable, or rather incapable of removal, than those in which complete extirpation can be attempted with any approach to success. Indeed, I should be inclined almost to go further and say that I see a majority of cases in which it is not even advisable to perform an exploratory laparotomy, so obviously unfit are they and so past all hope of affording any alleviation. Of the inadvisability of performing an exploratory laparotomy in these advanced cases I have no doubt, and for these two very good reasons : first, that the recuperative power of these patients is so reduced that the parietal wound often fails to repair properly, thus leaving a lesion which is not infrequently a source of considerable distress to the patient for the remaining period of life ; and, second, that the growth may attack the wound, grow through it—it being the line of least resistance—and produce a fungating mass on the surface of the abdomen, a condition which will prove alike offensive and trying to the patient and to all those in his immediate proximity.

When removal does not seem possible, either from extension of the disease to neighbouring parts or from metastasis, the situation of the growth may still be such as to admit of relief being afforded by the performance of gastro-jejuno-stomy. Executed in suitable cases, the operation not only affords relief, but unquestionably prolongs

life. Its value in this connection is sufficiently well known ; but I must instance one case, if only to show that age in itself may be no bar to an effort being made to give such temporary relief.

The patient was a minister aged eighty-four years. He gave a history of dyspeptic attacks appearing at intervals during the past nine years. The condition, however, for which he sought treatment commenced about six weeks previously, when he was seized with a severe attack of vomiting after his supper. Recurrence of this took place three weeks later. He then began to be troubled with severe flatulence, which caused a feeling of oppression in his chest and pain of a dull, aching character felt when he lay down at night. For some weeks he felt that he was losing flesh and strength. When examined, he was found to be a spare man, but in all respects healthy, except for his gastric condition. His stomach held four pints of fluid easily, the lower margin of the greater curvature being found to extend to below the umbilicus. Nothing could be detected by abdominal palpation. The result of a test breakfast was to show that total acidity, protein hydrochloric acid, total organic acids, and acid salts were all practically normal in quantity ; there was, however, total absence of free hydrochloric acid. At the operation a solid mass was at once encountered on opening the abdomen ; it involved the upper part of the pylorus, the lesser curvature, and the pancreas. As extirpation of the growth seemed impossible, the usual no-loop operation of posterior gastro-jejunostomy was performed. The operation lasted twenty minutes. He was in no way upset by it, and was perfectly well the next morning. He was given peptonised milk by the mouth. On the fourth day he was allowed up. On the eighth day the stitches were removed, and he was sent home to be attended by his own family doctor. Four months later his doctor reported that he was taking his food well and was, as he expressed it, "a walking wonder." I attribute not a little of the success in this case to the rapidity with which the operation was executed, and that he was not kept in bed longer than just sufficient for the parietal wound to heal. A man of eighty-four years will probably stand confinement less than almost any other alteration in his habits.

Of total gastrectomy, by which I mean the removal of the whole stomach up to the œsophagus, I have had no experience—for one reason, that the opportunity has never been afforded me of attempting such an operation. The cases are rare in which it is really suitable; and even if there are those which might be deemed proper for such radical treatment, the operation can be considered little else than “a brilliant exploit in surgical gymnastics,” to use the words of Mayo Robson in alluding to this procedure.

When the disease extends down the omentum, there is the possibility of invasion of the transverse colon; and if any hope is to be entertained of complete extirpation, a portion of the bowel must be removed with the involved area of the stomach. It need hardly, however, be stated, that when these extensive operations are performed, the hope of cure is very remote; and it is wise for us to consider how far we are justified in allowing the execution of a big operation to tempt us to expose our patients to the grave immediate risk which such endeavours necessarily entail.

When it comes to be a question of simply affording relief, we have in the operation of gastro-jejunostomy a valuable and comparatively safe measure at our disposal. The cases in which the operation is of most service are those where the disease causes obstruction to the pyloric outlet, or in which much pain is caused by taking food, provided, always, that there is sufficient room proximal to the disease in which to effect the anastomosis. If the operation is executed expeditiously, and with judicious consideration regarding the advisability or not of administering a general anæsthetic, I cannot say that the operation need be undertaken with any special fear that it will prove in itself fatal. Of course, if the case is really an advanced one, the patient's strength being already gravely sapped, there is considerable risk that the anastomotic wound will not repair, and leakage result. But if we do attempt an operation under these adverse conditions, it means that the patient is to all intents and purposes practically moribund, and we are merely trying to snatch him from the brink of the grave.

Our choice of position for the anastomotic opening must be guided by the location of the growth. The best place is on the posterior surface of the stomach, and sufficiently

far from the tumour that it will not be readily invaded by the extension of the disease. If, therefore, circumstances forbid the posterior surface, the anterior must be selected.

When the disease invades the cardiac end, and possibly obstructs the gastric inlet, gastrostomy can alone afford relief. In those very advanced cases where the disease invades so much of the stomach that no short-circuiting can be effected, we have only one last resource to fall back upon, and that is to completely cut off the stomach from taking any further part in the alimentary system by feeding directly into the jejunum. I once performed this operation in a case where the stomach was converted into a colloid mass. The man, aged fifty years, refused to take food because it caused him so much pain. There are two methods of performing jejunostomy, known respectively as Maydl's and Albert's. The latter brings a loop of the jejunum to the incision in the abdominal parietes, and secures it there beneath a band of skin and subcutaneous tissue (on the same principle as Frank's method of performing gastrostomy). An opening is then made into the bowel through which nourishment is introduced. The former, which is the method I employed in my case, divides the jejunum a few inches from the duodeno-jejunal bend, implants the proximal orifice into the distal segment about four to six inches from its orifice, and finally stitches the latter to the parietal wound. Thus, the food is inserted into the orifice, and joined by the bile a few inches down. My patient seemed slightly relieved; but regurgitation took place, and some troublesome excoriation of the skin ensued. He only lived three weeks; and I cannot feel that the operation had very much to commend it.

As a final note on the subject of treatment, I may add a few remarks on the performance of gastro-jejunostomy in conjunction with partial gastrectomy. After the removal of a part of the stomach the ideal operation would be to join the end of the duodenum to the end of the stomach, and so re-establish the direct continuity of the alimentary canal. From the difficulty of effecting a secure line of union, and therefore the certain avoidance of leakage, this method has been discontinued in favour either of gastro-duodenostomy or gastro-jejunostomy. The former operation, performed by Koch's method of first closing the

stomach wound and then planting the orifice of the duodenum into the posterior wall of the stomach, has much to commend it, and can be quite easily effected when it does not entail tension along the line of union. Probably, however, gastro-jejunostomy is the more frequently practised. There are no limitations regarding its employment ; and inasmuch as it is being so frequently practised for simple pyloric obstruction, it will be executed with greater expeditiousness and safety by reason of this experience.

In performing gastro-jejunostomy in conjunction with partial gastrectomy, some little difference of opinion exists among surgeons regarding the order in which each should be executed. Some prefer to excise first and then anastomose, while others practise in preference the reverse. I think, however, each case should receive separate consideration in this respect ; we may sometimes find it better to excise first because of the doubt regarding the amount to be removed, for if we have first anastomosed we may find that our line of excision is thereby limited and we are prevented from removing as much as we might wish. On the other hand, we shall always find it easier to anastomose first ; and this we may safely do when we are perfectly clear regarding the extent of the disease.

Primary sarcoma of the stomach, as judged by recorded cases, is a very rare disease, and more particularly so if the pyloric region be excluded. In other words, cases of well-defined and distinct non-ulcerative growths springing from the mid-gastric parietes are extremely exceptional. Probably one of the earliest recorded cases, or, at least, one of the earliest successful cases of removal of a tumour of this nature from the stomach, is that of Billroth's in 1881. Since then isolated cases have from time to time been reported ; and, if foreign records be excluded, very few have been published in the English language. In the past they appear to have been more frequently met with in the post-mortem room than in the operating theatre ; and a really correct appreciation of the relative frequency of the disease, therefore, could only be obtained by a combined investigation of surgical and pathological records.

I propose to give two illustrations of this rare form of disease which have come under my own observation.

The first was that of a maiden lady aged fifty-seven years, a teacher by profession. She was admitted into a private nursing home. Her history was that she had always enjoyed good health ; and with the exception that she had recently suffered from occasional attacks of frequency of micturition, her only complaint was one of increasing discomfort from enlargement of the abdomen. She was perfectly clear and emphatic regarding the entire absence of any gastric symptoms ; and being a particularly intelligent lady, such a statement may be regarded as possessing the truth. Menstruation had ceased two years previously. Prior to that, her periods had been regular and normal, accompanied only with some pain on the first day. Since the menopause, there had been no symptoms referable to the uterus. Her previous history was free from any disturbances of a local or constitutional character. The lower part of the abdomen was very prominent, and a large swelling could be felt filling the hypogastric and lower umbilical regions, with a leaning towards the right flank. The tumour felt quite smooth on the surface and appeared movable. There was no indication of fluctuation. Pressure caused no pain, nor, from the regularity of the bowels, did it seem to have any obstructive effect upon the intestines. Both flanks were resonant. An examination *per vaginam* revealed a small but freely movable uterus ; both fornices were empty ; and the tumour seemed to be entirely without the pelvic cavity. In the absence of any very striking differential symptoms, and therefore mostly on the score of probabilities, the case was considered one of ovarian cystoma.

The abdomen was opened by a curved incision below the umbilicus. A smooth rounded tumour was at once encountered, presenting a dark mottled and striped appearance. The hand introduced into the abdomen felt a nodular projection at the upper part, with attachments below to the omentum and above to the stomach. The growth was felt to be free from any connections with the pelvic viscera. A small medium incision carried upwards permitted the tumour to be brought out. After tying off the few omental adhesions, the growth was then discovered to be united by a solid pedicle, about the diameter of the thumb, to the greater curvature of the stomach some two inches or so from the pylorus. The part of the gastric parietes

involved was excised, and the aperture closed by a double row of sutures. The patient made an uninterrupted recovery.

The specimen, when examined after removal, was found to be a large unilocular cystic tumour with smooth external walls, and filled with laminated clot. It measured $14 \times 14 \times 11\frac{1}{2}$ cm., and was adherent to the wall of the stomach. The tumour, with a portion of the stomach wall involved, was examined by the pathologist, Dr. Anderson, whose report was: "Section of the invaded gastric wall showed a somewhat gelatinous appearance with healthy-looking mucosa covering it. Section of the wall of the cyst showed, under a low power, a fibrous stroma supporting a cellular element. In parts of the section the structure was somewhat of a loose character; in other parts, dense and cellular. At the periphery the fibrous character was more apparent, and the outer part of the tumour area had an appearance not unlike that of a spindle-celled sarcoma. In the central part of the section thin-walled congested vessels were fairly abundant, and extravasations of red blood-cells were also apparent. Spaces resembling fat-cells were also seen in the section. With the high power, the character of the cells which composed the tumour were found to fall into two groups—cells of connective-tissue origin, fibroplastic and definitely spindle in shape; and larger cells of spherical shape, with sharply staining nucleus and a large protoplasmic body deficient in chromatin. Well-formed blood-vessels were present in the section, and in a few places small nodules of lymphoid cells were also present. The characters of the section would suggest a tumour of mesoblastic origin, viz. a mesothelioma. Microscopical examination of the stomach wall showed that the mucous membrane and submucous layers were unaffected by the tumour involvement, but the muscular wall showed extensive infiltration. Areas of tumour cells extended between the muscle bundles, and in parts replaced them. Under the high power the same character of cells was noticed as above described in the cyst wall, but the larger spherical cells were more abundant."

The second case was that of a man, aged sixty-three years, who was admitted to the Victoria Infirmary suffering from what proved to be a tuberculous stricture of the rectum.

At the time of his admission there were no gastric symptoms, his trouble being entirely referable to his rectum. The stricture was successfully excised, and he remained well for some years. He then began to be troubled with prolapse of the rectum and some incontinence of fæces. For this he was readmitted in September 1909, *i.e.* six years after his first admission. During this period of residence he complained of very distinct gastric symptoms; he had a distaste for food, and felt occasional pain in the epigastrium; the latter, however, seemed to have no association with the taking of food. He did not vomit, nor did he feel any inclination to do so. There was no tenderness in palpating the epigastrium, nor could anything be felt; he, however, was quite definite and positive in his statement that a lump occasionally appeared on the left side of his abdomen just below the costal margin. As the condition of the bowel was solely under consideration, the gastric symptoms did not receive the amount of attention they deserved. He was in a very low and enfeebled state of health, and succumbed after the operation attempted to relieve the prolapse. A post-mortem was obtained, when the following conditions in connection with the stomach were found: Adherent to the stomach was a large cystic tumour, somewhat larger in size than a child's head, springing from the greater curvature of the stomach, with smooth external wall, unilocular, filled with blood-stained fluid and soft tumour tissue resembling in appearance partly organised blood-clot. The mucosa was healthy. The microscopical examination of the tumour showed its character to be that of a spindle-celled sarcoma, fairly dense in consistency. Throughout the section were noted a number of new-formed thin-walled vessels filled with blood, and, in parts, extravasations of blood were seen. The section through the stomach wall showed tumour infiltration of the serous and muscular coats. The mucosa was found uninvolved. There were no evidences of tumour formation in any other part of the body.

I have no intention of going into the literature of the subject, but there are two recorded cases to which I would particularly refer, because in certain points they markedly resemble my own. In one, recorded by Hartley (*Annals of Surgery*, vol. xxiii, 1896, p. 609), the tumour was a

spindle-celled sarcoma, and like, therefore, my second case. In the other, recorded by Cantwell (*Annals of Surgery*, vol. xxx, 1899, p. 596), the clinical resemblance to my first case was most striking; in neither were there any symptoms attributable to the stomach—indeed, the sole complaint made by each was the increasing discomfort engendered by the abdominal distension. Strangely, also, a further agreement existed in the fact that in both instances it was thought likely that the tumour was connected with the genital organs. I must own that no other thought entered my head; for although the vaginal examination showed the pelvic organs free, it simply left the impression that the supposed ovarian cystoma had swung itself free from the cavity of the pelvis. We were further misled by the patient's statement that she first noticed the swelling in the right flank. It must be deemed a remarkable fact, as much in my own case as in that of Cantwell's, that such large tumours could hang from the gastric parietes without interfering with the normal functions of the viscus and causing some sort of dyspeptic symptoms.

The tumours from these cases were examined and reported on by Dr. John Anderson, pathologist to the Victoria Infirmary, to whom I am also indebted for the following remarks on them: "Both the tumours presented a marked similarity in their external appearances, being cystic in character and covered by a smooth external peritoneal lining, and both springing by a definite pedicle from the wall of the stomach, the mucosa of which in both cases was involved. The second case presented the definite microscopical appearances of a spindle-celled sarcoma; the first case, on the other hand, showed the presence of characters of a spindle-celled sarcoma and endothelioma in different parts. The following quotation from a paper on the subject by MacCormick and Welsh (*Australasian Medical Gazette*, July 20, 1906) is of interest. These authors state: 'It is sometimes hard to decide whether the growth has started in the stomach or has taken its origin in some adjacent structure. In the case of the spindle-celled sarcoma, they rarely present this difficulty of interpretation, and their origin in the submucosa is more generally accepted. They commonly take the form of localised growths which sooner or later

project from the outer surface of the stomach ; and when, as so often happens, they grow from the posterior wall, they pass into the lesser sac of the peritoneum, which they may come to distend. As they increase in size, they frequently become pedunculated and may form adhesions to adjacent structures.'

"It is in connection with the first case in which both spindle and endothelial cells are present, that the difficulty arises. I described it, in the account of one section, as a mesothelioma, and from this I infer that it had its origin in or beneath the serous coat. Similar difficulties in reviewing the tumours of the round-celled sarcomata group have been experienced by the above-named authors ; but here the question was whether the case was a primary sarcoma, or secondary infiltration of the stomach wall of the nature of that seen in lymphocythæmia. But the clinical history and present satisfactory condition of the patient are more in favour of the opinion I have expressed."

CHAPTER XII

GASTRECTASIA. GASTROPTOSIS. GASTRIC NEUROSIS

ONE or other of these conditions occasionally confronts the surgeon, and many difficulties encumber the question of, whether or no, operation can offer any hope of relief or cure. Much, if not all, depends on the nature of the cause ; but this, in many instances, cannot be determined until an exploration has been performed, and even then we may be left in doubt whether to desist from any further procedure or to attempt some particular operation which we can only vaguely hope may be fraught with benefit. However, each condition must be considered separately.

GASTRECTASIA

A dilated stomach is often spoken of as if it constituted the complaint itself—as if it, and it alone, was the condition to be treated. Doubtless, of all the physical signs which

a deranged stomach may present, none manifests itself more prominently, or is easier of detection when present to any extent.

What does a dilated stomach mean? The question is of infinitely greater importance now than it was some years ago. I suppose the large majority of cases then were considered the result of muscular atony of the gastric parietes; and it was not until the intervention of surgery that the fact was revealed that a great many of these cases were found to depend on pyloric obstruction; and even now it is no infrequent occurrence to come into contact with cases that are called atonic dilatation when the real cause is a narrowing of the pyloric aperture.

If it were not for the fact that I see so many cases thus mistakenly diagnosed, I should not venture to question the truth of such a condition as uncomplicated gastrectasia. What makes one still more dubious about the certain existence of such a condition is that we are unfamiliar with it in other organs or parts where a structure like to that of the stomach is present. Thus, we know nothing of atonic dilatation of the gall-bladder, of the urinary bladder, or of the colon, except as the result of obstruction. Why should the stomach dilate so long as the opening between it and the duodenum is of sufficient calibre to admit of ready and easy access between the two viscera? But I must not labour the point too much. I only argue as a surgeon; but, as such, my work has often revealed the fact that what was considered a so-called simple atonic dilatation of the stomach accompanied, as it sometimes is, with chronic gastric catarrh, was in reality the result of a narrowed pylorus, the remedy for which was at last obtained by enlarging the same, or by making a short-circuit. I have, therefore, come to assume very much this attitude in regard to most of these cases, that if the patient is on this side of middle life, and has all the appearance of good health, except such ailments as may be traceable to the gastrectasia, pyloric obstruction is, in nearly every instance, the cause of the dilatation. This does not imply that the obstruction is the result of previous ulceration with subsequent cicatrization, in which case early symptoms of the same might be expected; but that it may be, and I believe very frequently is, due to an

abnormally small aperture, such as I have already described at considerable length, under the designation of "Congenital narrowness of the pyloric aperture" (*see p. 142*).

The special feature about dilatation of the stomach, from whatever cause, is, in more particularly its early stages, the intermittency of the dilatation. At times the stomach completely empties itself; while at other times it fails and then dilates.

Other causes for obstruction are to be found in conditions external to the pylorus such as adhesions which kink or compress it; but these act in a similar way by causing physical obstruction. Apart, however, from influences effected solely through the action of the pylorus, I have known dilatation result from perigastric adhesions involving the body of the stomach. Here it would seem as if the muscle parietes were hampered in their action, and the stomach, being checked in its normal function of contraction, has dilated, or, at least, been so interfered with in its power to empty itself, that a considerable residue has been removed some hours after a meal.

Gastropsis, of which more will be said later, may also cause dilatation because the sagging of the stomach may result in such an acute bend at the junction of the viscus with the duodenum that obstruction follows.

The symptoms of dilatation require but very few remarks. Succussion is usually present; but to be of any diagnostic value it must be detected not less than three to four or more hours after food. The patient is himself often conscious of "splashing." A sense of fullness is frequently experienced; and the patient will sometimes state that, in order to relieve the feeling of constriction, waist-bands must be relaxed. Flatulence may be very troublesome; and quantities of gas, sometimes accompanied with mouthfuls of sour material, may be belched up. The best evidences, however, are obtained by washing out the stomach, and by distension with gas.

Apart from the results of lavage, the patient not infrequently states that he is surprised at the amount he ejects, more, as he thinks, than he has taken. The returned material also is often noted to contain fragments of ill-digested food taken possibly the preceding day, or, at least, at two or three meals previously. The first wash-

out of a stomach, which is dilated from obstruction, is often very typical; it looks like thin porridge, and is very sour to smell. This symptom may be regarded as practically pathognomonic.

As active measures to be taken in order to determine the power of the stomach to rid itself of its contents, the following procedure should be followed. After the stomach has been properly washed out, a good meal should be given embracing a currant sandwich. Six hours later it should be removed, when the presence of currants and other undigested products will be sufficient evidence of pyloric obstruction and dilatation. The tube used for washing out the meal may be at once employed for distending the stomach. My own practice is to affix the nozzle of an ordinary Higginson's syringe to the end of the tube, exercise a few rapid squeezes of the bulb so as to cause the pylorus to contract, and then continue to slowly distend until the patient commences to feel some slight discomfort. A dilated stomach will then be found to extend below the umbilicus to variable distances, and often to the right of the middle line; indeed, this distension of the pyloric antrum is peculiarly significant of dilatation. I have not infrequently found a well-marked little pouch quite close to the pylorus. It is as if the stomach, in its struggle to get its contents through the normal opening, brought its most powerful propulsive efforts to bear on that part of its parietes nearest to the natural outlet. If such a construction of this tendency to dilatation of the pyloric antrum be correct, it is not without its lesson on the position in which we should make our artificial opening for relieving the condition. This practical item will, however, be further referred to in discussing the operation of gastro-jejunostomy.

Instead of forcibly distending with gas in the way just described, some clinicians prefer to give drachm doses of carbonate of soda and tartaric acid, the liberation of carbonic acid serving equally well to distend the viscus.

In considering the question of treatment, more depends on the cause of the dilatation than on the dilatation itself. It is doubtful whether we can ever regard dilatation as anything more than a symptom; and, as with most symptoms, we can adopt measures to relieve them without

effecting any curative result, unless the measures employed deal with the primary cause and not simply with its consequences. Dilatation, therefore, dependent on obstruction, or on influences impairing the muscle function of the stomach, must be dealt with by measures that directly aim at treating these causes.

In the earlier periods of gastric surgery, before due recognition of the frequency of obstructive influences, it was not an uncommon practice to lessen the size of a stomach by plecting its walls, an operation known as gastrorrhaphy. Different methods were in vogue for the performance of the operation. The cases, however, in which this particular mode of treatment is now called for must be very few. Indeed, for the last ten years or more I have never performed the operation; nor can I say that I have encountered a case that seemed to me in any way suitable for its execution.

Assuming that there exists such a condition as atonic gastrectasia, it is extremely probable that the dilatation is part of a systemic or constitutional condition the successful treatment of which may be sufficient to restore tone and power of contraction to the muscle parietes of the stomach.

If it is purely a question of affording relief, then systematic lavage of the stomach will in most cases effect such a result. Lavage, however, may prove worse than useless; indeed, it may be positively harmful; for, if it only serves to postpone the employment of that which alone could cure, then it is useless; and if it increases the dilatation, as repeated distension with fluid is liable to do, then it is distinctly harmful. But lavage carried out as a preparatory measure to operation is valuable, and should be adopted with considerable persistence and thoroughness whenever retention and fermentation have been long pre-existent conditions.

Delay in the treatment of gastrectasia is fraught with some danger, because of the possible occurrence of gastric tetany. Fortunately, we rarely encounter this almost always fatal condition nowadays, because it is seldom that a case is allowed to reach such an advanced stage of distension, requisite for the production of the disease, without operation.

GASTROPTOSIS

For the production of uncomplicated ptosis of the stomach, there must co-exist an abnormal elongation of the lesser omentum ; not that this suspensory ligament is naturally long, but that from some acquired cause it has become so. The result, therefore, is that the stomach occupies a lower position in the abdomen than it should, and that the abnormal dropping leads to symptoms indicating that the usual functions of the stomach are in some way interfered with. As far as my experience goes, such a condition as that described is rare ; and that when we have a downwardly displaced stomach it is either part of a general visceroptosis, or it is due to the viscus being dragged down by adhesions contracted between the omentum and either the abdominal or visceral parietes or inflammatory affections of the pelvic viscera.

The causes of visceroptosis are usually lax abdominal parietes, and a general lack of tone about the intra-abdominal connective tissues. Possibly, the constricting effects of tight corsets may, in some instances, be answerable for the downward displacement of the abdominal organs, the pressure above stretching and elongating the natural suspensory agencies. While there may be no symptoms directly associated with many of the ptosed viscera, the stomach may evince symptoms indicative of considerable derangement. The dropping of the viscus may result in some kinking of the pylorus, and so lead to such secondary complications as obstruction and dilatation. It is only when such a specific complication occurs that the question of operation on the stomach may be raised. The remedy may, in some cases, be effected by lifting the organ either by shortening the gastro-hepatic omentum, or by securing the stomach to the abdominal parietes above, by the operation known as gastropexy. It is doubtful, however, whether this latter operation should ever be considered, for the formation of adventitious adhesions between the abdominal parietes and the gastric wall may lead to a series of symptoms more painful and troublesome than the original condition for which the treatment was executed. Plication and fixation of the

lesser omentum affords a more reasonable method of procedure; but the chief disadvantage of the method lies in the possibility of the tissues again stretching, and the consequent reproduction of the ptosis. In one of my cases, however, I was able to show two years after the operation that the stomach still maintained its suspended position; but the fact that some obstruction continued to exist compelled me to perform gastro-jejunostomy. In two cases I performed gastro-jejunostomy as a direct means of treatment. In one case the result appeared permanently good; the other case I lost sight of. If, therefore, it does happen that we occasionally encounter a case that requires treatment, I am disposed to think that gastro-jejunostomy is most likely to afford the best results. I trust, however, that I have said enough to show that gastropptosis is, as a rule, not a condition to be treated by itself regardless of the associated enteroptosis or more generalised visceroptosis which so frequently accompanies it. Much should be attempted by conservative measures before operation is resorted to; and when we do deal exclusively with the stomach, it must be clearly on the belief that much if not all of the patient's sufferings are directly attributable to the stomach; and that the relief of the symptoms arising therefrom will go far towards obtaining the desired result.

GASTRIC NEUROSES

Under this expression, I wish to refer to a series of cases that it is difficult to classify in any other way than by the use of a term that implies an origin in some obscure nerve condition. The complaint, whatever its cause, is apparently functional and not organic. While the gastric symptoms are usually the most prominent, they are frequently not the only ones present; indeed, they are merely part of a more generalised neurotic condition which finds its expression in many other parts, and generally awakens the suspicion that our patient's gastric trouble is not the cause but the consequence of inexplicable influences working through a deranged nervous system. The one and great clinical feature in these cases, and that which always arouses our interest and excites

our doubt, is the absence of other symptoms whose presence would naturally be expected if the subjective signs complained of really indicated an organic lesion. But very often these patients will give a history of symptoms which is so suggestive of real disease that it is difficult, if not impossible, to differentiate between what is indicative of organic mischief and what of a purely functional derangement. Perhaps, of all lesions, that of gastric ulcer is most frequently simulated; certainly it is in supposed conditions of this kind that an exploratory operation is most frequently performed.

The question will doubtlessly be asked: What interest have these cases for the surgeon? It is quite true that nothing of an essentially functional character usually calls for operative intervention. But the fact remains that where, from mistaken diagnosis, an operation has been performed, a cure has resulted. What constantly happens is this. The surgeon is asked to see a case because of the intractable character of certain supposed gastric symptoms. Usually the patient has been under a prolonged course of medical treatment; but no improvement having resulted, the question of operation is raised. The operation is belittled in the eyes of the patient, and she—for these cases are usually of the female sex—is assured that no possible harm can accrue. An exploratory operation is accordingly executed. The abdomen is opened, and, if thought advisable, the stomach also. A thorough investigation is carried out both by palpation and by inspection. Nothing is found. Henceforward the patient is confidently given to understand that she has been cured. This she believes; and the result is complete relief of all the old gastric symptoms. I do not venture any attempt to explain how this all comes about; but the simple fact remains, that by influences, moral, psychical, or physiological, some systemic change is effected which nothing but an operation seems to have been capable of accomplishing.

Nothing will, perhaps, better illustrate the truth of these statements than the narration of a case or two. One was that of a married woman, aged thirty-five years, who had had nine children. Her stomach symptoms commenced six years ago. At this time she suffered from occasional

cramp-like pains across the epigastrium from half an hour to an hour after food, and usually of one hour's duration. She was also much troubled with flatulence; and she found that if she took greasy fluids, such as certain kinds of soups, the pain was liable to commence. This pain would sometimes go away for a considerable period, but it always ultimately returned; and each subsequent attack was more severe than the previous one. Since her last confinement, fourteen months ago, her symptoms had become much more acute. Vomiting would sometimes relieve the epigastric cramp-like pains, but at other times it seemed to increase the symptoms. She had a good appetite, but confined herself to light diet, thinking that would lessen the occurrence of the pain. For three months last year she was entirely free of any symptoms. When admitted to the hospital she was seen to be particularly well nourished and of fairly good complexion. Her tongue was clean and moist, and her teeth good. There was some tenderness about two inches above the umbilicus, but otherwise physical examination was negative. She suffered from constipation. Urine normal.

The very indefinite nature of the symptoms, together with their unamenability to any medical treatment, seemed to justify an exploratory operation. The abdomen, accordingly, was opened; and although a thorough and systematic examination of the stomach and other intra-abdominal organs was carried out, the result was entirely negative. She made an uninterrupted recovery, and when leaving the institution a month later she was quite well. She was again seen three and a half years later, her health was still good, and she had never had any return of her old symptoms since her operation.

A second case was that of a young unmarried woman aged twenty-four years, who, until six years previously, had always enjoyed good health. At this time she had an attack of what was called "ulceration of the stomach." Her symptoms then were severe pain in the lower part of the chest, and indigestion. She did not vomit. She recovered completely from this attack, and remained well until five months ago, when she began to suffer from a dull pain in the epigastrium, more to the left side than the right; this was felt about twenty minutes after taking

food, and lasted for an hour or two ; nothing seemed to give her relief. She stated that she was constipated, and suffered from headaches. On admission to the hospital she was noted as being of a somewhat nervous disposition, well built, but somewhat thin. Her complexion was good, tongue fairly clean, teeth moderately good, mucous membranes healthy, reflexes active. Nothing was made out by physical examination except that there was slight tenderness in the right epigastric region. A "test breakfast" showed the presence of plenty of free hydrochloric acid. All her other organs were apparently healthy.

In this case as in the last the indefiniteness of her symptoms left it in doubt what might be at the bottom of her trouble ; no medical treatment had effected any good, so an exploratory operation was proposed. The abdomen was opened, and as this proved negative, the stomach was incised on the anterior wall and both by finger and speculum the cavity examined. The result, however, was again negative. She made an uninterrupted recovery, and when seen two and a half years later she reported herself as enjoying perfect health, and as having been absolutely free from all her old gastric symptoms ever since the day she was operated upon.

These cases, even in narration, hardly seem to convey that sense of indefiniteness which they present when actually encountered. One is always naturally led to think of the possibility of the existence of some such organic lesion, for instance, as perigastric adhesions ; that the gastralgia, which generally proves itself such a prominent feature, has a real, organic origin. One certainly always likes to feel that operation is being proposed on some reasonable basis, and not on that very doubtfully justifiable plea of looking to see if anything is wrong. I would deprecate most emphatically any inquisitive inspection merely to satisfy curiosity. If we open the abdomen we must do so on good grounds ; in the belief that there may exist something which our operation will enable us to deal with, and which other means, well tried, have failed to relieve.

When, then, it happens that our inspection proves negative, our future course should be to take care that our patients are kept quite ignorant of the truth of the result :

rather must we imbue them with the belief that they have been cured. The influence of the mind over the body is too well known to need discussing ; but it would seem as if an operation came to our aid, enabling us to emphasise that effect, and produce a result which nothing less powerful was capable of accomplishing.

We must not, however, be tempted to allow this reasoning to lead us to adopt measures, justifiable in cases such as the above, but not so when dealing with cases of a more generalised neurotic or neurasthenic type. There are patients, for instance, whose gastric symptoms are unmistakably only a minor factor in the manifestations of a more generalised systemic disturbance. I allude more particularly to those cases, most frequently met with in young male adults, where there is a general want of vigour and tone throughout the body. These patients often have a pallid complexion, are deficient in mental and physical power, possess a poor appetite, suffer from headaches and a certain amount of insomnia ; and with these symptoms there is often, that which is of considerable significance, the occasional presence of mucus in the motions. No good whatever will result from any exploratory operations in these cases ; and to attempt anything like gastro-jejunostomy, with the supposed object of relieving the gastric symptoms, is certain to be followed with disappointment, if not with actual regret.

In one's earlier efforts, and in the belief that the stomach might be primarily at fault, I have been more than once persuaded to try the effects of operation in these cases. Experience, however, has taught me that such attempts are a mistake, and only tend to bring discredit upon measures which, when rightly used, are often of such exceptional benefit. The subject may not be worthy of the attention I have drawn to it, as none but the young and inexperienced surgeon is likely to be misled by a series of symptoms which nowadays have come to have a more correct interpretation placed upon them. They belong to a past era of our art, when we were tempted, in the natural enthusiasm which attended the dawn of abdominal surgery, to believe that, in exploratory operations and more advanced procedures, we had discovered panaceas for all sorts and conditions of the stomach which

had so far defied the therapeutical armamentarium of the physician. Perhaps among some of the most difficult cases that confront us, in which the question of operation is raised, are those where the gastric symptoms are unmistakably part of a genuinely neurotic state. We do not believe the stomach is really at fault, however much the patient himself considers it so ; but we feel that an operation may produce such a profound impression on the patient's nerve system that good will result. It is quite impossible to lay down any definite rule with regard to these cases. To talk of operation in any sense as a routine of treatment for what might be termed a "hysterical stomach" would be quite inappropriate, if not actually wrong. It must only be resorted to as a final measure, when every other legitimate means has been attempted ; and when it is really felt that a profound impression, such as that produced by the administration of the anæsthetic and the performance of an operation, is reasonably likely to effect the desired result. I hope I have made it quite clear, in repeating my opinion, that operation is not advocated in these cases ; but that it is only undertaken practically under what might be more fittingly expressed, compulsion.

CHAPTER XIII

REMARKS ON THE OPERATIONS OF GASTRO- JEJUNOSTOMY, GASTRO-DUODENOSTOMY, AND PYLOROPLASTY

IN 1892 I performed my first gastro-jejunostomy. My patient died as did the three succeeding cases upon which I executed the same operation. Somewhat disheartened I went to Vienna, the birthplace of the operation, in 1881, to see it performed. No mechanical agents were used to connect the bowel with the stomach, simple suturing alone was employed. I returned home well imbued with a sense of needed care and confidence. Success and not failure attended my future efforts ; and I can now boast of a percentage mortality of two in my last series of one hundred cases. This personal exhibition of failure and

success I am tempted to give because it fairly well represents, I think, the general progress that has taken place in the performance of this operation within the last twenty years. According to Paterson (Hunterian Lectures, 1906) the mortality of the operation in the early nineties was about 40 per cent.; while to-day, in experienced hands, it does not much exceed 2 or 3 per cent.

In the following remarks I merely wish to deal with a few practical points the outcome of twenty years' experience. The operation itself is probably one of the most interesting in surgery. From its inception, based largely on experimental work on dogs, up to the present day, the operation has been encircled with doubts and difficulties that have at times so encumbered its progress as almost to defeat its advance. But, like all great results, these obstacles have only tended to promote perfection; and now we have in the operation a means of prolonging life and restoring health so safe and certain that, in the whole domain of practical surgery, there is nothing that can be said to surpass it in the great ends it is capable of accomplishing. There yet remains to be written an exhaustive history of this operation; and, when such an effort is accomplished, it will prove one of the most interesting and instructive records in the annals of surgery. There are few of us who can adequately realise, from personal past experience, the amount of human misery and suffering, due alone to pyloric obstruction, which existed prior to Wolfler's first successful operation in 1881. But we are fortunately permitted to see, nowadays, how that misery is turned into joy. And I know of no gratitude so great as that expressed by the poor sufferer who has to vomit all he has taken to obtain relief, when he finds, as the result of the operation, he is able to eat and drink to his heart's content, and enjoy life like other people.

No better testimony could be borne to the truth of these remarks than that of an unsolicited letter which I found awaiting me one morning on my arrival at the Infirmary. Personal as it is, I am tempted to give it as a practical illustration of what I have just stated. It ran thus: "Dear Sir,—I hope you will excuse the liberty I am taking, when I write to thank you for the great benefit I have received from the operation you performed upon me

two years ago last Friday, for a dilated stomach. You promised me at the time that it would mean new life to me, and I must say it seemed hardly credible to me after suffering for over twelve years, but I am pleased to let you know that I am enjoying better health than I have known for a long time. So again I ask you to accept my sincere thanks. I am, yours very gratefully." The operation in this case was gastro-jejunostomy for cicatricial contraction of the pyloric aperture.

But if our results are to be such as will attain to the best possible, it will only be by the most careful attention to every detail in the execution of the operation. Any failure in this respect may not only be fraught with disappointment but actually followed by danger and disaster. Indeed, it was owing to some very simple defective details that led to most of the early failures ; and, possibly, to no one item was this defectiveness more attributable than to inefficient and insecure suturing.

One of the earliest opposing forces which the operation had to combat was the supposed deleterious influence likely to result from the contents of the stomach passing directly into the jejunum. Physiologists, and none more clearly and forcibly than Pawlow, demonstrated the wonderful sequence of events which followed the passage of the food from the mouth to the intestine. Each anatomical segment of the canal constituted a link in the unbroken chain of perfect digestion. Not the least important link was that formed by the duodenum with its carefully guarded entrance at the pylorus, and the duct which conveyed the secretions of the liver and the pancreas into its canal. These several anatomical and physiological "links" in order to exercise their proper functions, so far as the mid-digestive tract was concerned, were proved to be regulated by the egress of the properly digested food from the stomach.

But the operation, it was confidently asserted, would entirely upset this wonderful natural arrangement ; and the result could not be otherwise than a serious and detrimental disturbance of the regular metabolic processes. While, however, physiologists and physicians were impugning the operation, and forecasting deleterious consequences, surgeons were obtaining results which not only

rebutted these fears and adverse opinions, but actually showed that, at least, so far as immediate results were concerned, nothing could appear more encouraging.

In recent years, however, experimental research has shown that, comparing the amount of nitrogen and fat excreted with that ingested—in cases where gastro-jejunosomy has been performed at variable intervals of time previously—there is an inappreciable loss (H. C. Cameron, *British Medical Journal*, January 18, 1908); so that Nature, with her wonderful powers of adaptation to altered circumstances, seems able to link up the broken chain and permit metabolism to progress under practically normal conditions.

Thus, then, so far as the purely physiological aspects of the question are concerned, experience and research alike go to support the present opinion that no fear need be entertained regarding the possible shortening of life through deficient or defective metabolism.

I will now discuss some of the details in connection with the execution of the operation.

Considerable difference of opinion has waged over the question whether anastomosis should be effected on the anterior or the posterior wall of the stomach. Paterson, in his Hunterian Lectures already referred to, thrashes out the question pretty thoroughly, and leans himself towards the anterior. (This was in 1906, the year in which he delivered his lectures.) But judging by the reports of cases, both at home and abroad, there can be but little doubt that the posterior is mostly favoured by surgeons. My own practice is certainly in favour of the posterior; but occasionally cases occur when the anterior seems advisable. I think, therefore, that one should exercise judgment in the selection of one or other operation, systematically practising the posterior, but adopting the anterior when circumstances appear to favour it.

In order to lay hold of the jejunum after the abdomen has been opened, all that is usually necessary is to pass the forefinger and thumb of the right hand down to the left side of the spinal column. The particular segment required, that is, that just beyond the duodeno-jejunal bend, usually lies here; and can at once be picked up. It is further recognised by its thicker and more

fleshy wall and uniformly larger calibre compared with the ileum.

The particular place in the jejunum selected to make the opening was, for long, several inches from the duodeno-jejunal bend. Personally, I early gave up this situation, believing it to be less in conformity with the normal anatomical disposition of the parts when the stomach was replaced in the abdomen. In 1898 I commenced making my opening close to the commencement of the jejunum, ignorant entirely of the practice of others ; and it was only when Czerny, Mikulicz, Mayo, and others published papers on the subject of what was described as the "no-loop" operation, that I learnt that others were in favour of this particular procedure. It is now practised to the almost total exclusion of the "long-loop" operation. Its adoption has contributed one deterrent factor to the production of the "vicious circle" ; for it seemed as if the long portion of the jejunum proximal to the anastomosis came to assume an almost vertical position, so that its contents—the bile and the pancreatic juices—were projected directly into the stomach.

The particular place on the posterior surface of the stomach where the opening should be made has undergone some changes. In the earlier periods, when the operation was considered, primarily, a means of draining the stomach, it was thought that this would be best effected by making the opening close to the greater curvature, and rather towards the cardiac than the pyloric end.

The frequency with which bile was poured into the stomach led, I think, more than anything else, to the consideration of the normal movements of the viscus ; and, as a result of this consideration, it was concluded that, in all probability, the natural churning action which took place may have induced suction of the contents of the proximal jejunal segment into the cavity of the stomach. Further, it was felt that when the stomach sought to empty itself, its natural tendency was to project its contents towards the pylorus ; and, therefore, that an opening made as close to the pylorus as possible would be more likely to effectually drain the organ than if placed elsewhere. Still further support of this tendency of the stomach to project its contents towards the pylorus is found in the pathological

fact, already referred to, that when there is marked obstruction at the outlet the pyloric antrum becomes dilated out of proportion to the rest of the stomach ; and this must be due to a propulsive influence in the direction which the obstructed pylorus fails to relieve. Thus, then, it came about, that instead of making the opening in what was supposed to be the most dependent part of the stomach, it was made close to the pylorus ; and that position, I think, is now almost universally adopted. Cameron, however, in his paper already alluded to, advocates making the opening in cases of ulcer of the stomach, uncomplicated with pyloric obstruction, farther away from the pylorus in order to ensure the entrance of bile and pancreatic secretion into the stomach ; for, by this means, the usually hyperacid gastric juices are rendered alkaline ; and this alkalinity is a factor of no mean importance in bringing about a cure of the ulceration. It is questionable, however, whether the good, thus supposed to be effected, is not probably outweighed by the possible sequence of a "vicious circle" so troublesome that a second operation may be required for its relief. But although the neutralising effect of the bile and pancreatic secretion may not be so great, from lack of quantity of these juices, in the one operation as compared with the other, it is questionable whether the amount, which in all probability, in most cases, regurgitates more or less through the patent pyloric aperture, as well as through the artificial opening, is not sufficient.

The next disputed point in the operation has been the particular line the incision should take in the stomach. This, however, has been pretty well settled by selecting a course which runs parallel to, and midway between, the two curvatures, the distal extremity of the incision approaching as near as practicable the pylorus. The vessels, therefore, are cut transversely. The circular muscle fibres are also cut transversely ; and as these constitute the propulsive agents for the final ejection of the stomach contents, it is possible, as pointed out by Paterson, that their contraction widens the aperture, and so more readily admits of easy egress.

The length of the incision, or, in other words, the size of the artificial opening, is a consideration of much importance. The opening apparently always tends to contract

somewhat ; hence, if made too small, it may become so narrowed as to fail in fulfilling the end for which it was executed. When Murphy's button was used, contraction to a considerable extent was no uncommon result. Not only was this due to the necessarily small opening which the button made ; but, inasmuch as the compression of the two halves of the button caused necrosis of the intervening parts, a ring of granulating tissue resulted when the button became detached ; this, as healing took place, left a contracted cicatrix. In order, therefore, to counteract with certainty any hampering narrowing of the artificial orifice, incisions of three inches in length have by some been advocated. It is difficult sometimes to get this amount of gastric surface exposed through the opening in the mesocolon. Two inches, I believe, is ample if care is taken to unite accurately the margins of the gastric and intestinal mucous membranes.

But whatever be the length of the cut we make—more particularly in the stomach—the condition of the visceral parietes at the time counts for a good deal in the variations of extent which may result. For instance, a two-inch incision through the walls of a contracted viscus might be equal to a three-inch one when the parietes were in a relaxed state. Some attention, therefore, should be directed to the state of walls, whether contracted or relaxed, at the time of operation, in order to avoid making an inordinately large orifice or an unduly small one.

There is always, whatever the size of the opening, a redundancy of the intestinal mucous membrane ; but rather than cut this away, I prefer to stitch it to the gastric mucous membrane, believing that its laxity and excess will still further tend to prevent any possible exposure of the submucous connective tissue, and add to the permanent patency of the opening. It should be remembered that, under the conditions in which we are operating, the parts are in a generally relaxed state ; but when, through post-operative flatulency, there is distension and stretching, it is quite possible that the redundant mucous membrane may subserve a very useful purpose in protecting the deeper tissues from infection by the gastro-intestinal juices, not to mention other agencies, possibly septic in nature, which come from the ingesta.

Before the bowel can be applied to the posterior wall of the stomach, the transverse colon must be well pulled upwards in order to place the mesocolon on the stretch. With the stomach and colon thus well withdrawn from the abdomen and turned upwards, the fingers of the left hand are used to push the gastric parietes against the mesocolon ; and then with the points of the blades of a pair of dissecting forceps the mesocolon is teased through until the lesser cavity of the omentum is entered. The wall of the stomach can then be pushed through the rent ; and when the latter has been sufficiently widened to admit as much of the stomach as required, the edges of the mesocolon are stitched by three or four sutures equidistant from each other to the gastric parietes. There is much difference in the thickness of the margins of the mesocolon rent, and in the ease with which these margins can be forced apart. There is also a considerable difference in the conditions of the lesser cavity of the omentum. In many cases there are soft adhesions which seem to prevent the exposure of a clean serous surface on the posterior wall of the stomach. These are probably the result of a gastric catarrh. There are two very good reasons why the margins of the rent in the mesocolon should be sutured to the stomach ; one is to prevent the possibility of a loop of small intestine slipping through the rent and causing strangulation ; and the other, that the aperture contracting may constrict the attached loop and cause obstruction. These are no mere theoretical considerations ; they have both proved sources of fatal results.

In applying the loop of the jejunum to the stomach, care must be taken not to twist the intestine in its long axis ; and also to make the incision into the bowel parallel and opposite to the attachment of the mesentery.

The application of one viscus to the other may be effected by means of specially designed clamps, or by using four pairs of ordinary artery forceps which, held by an assistant, serve to keep longitudinal segments of the intestine and stomach in contact while the first line of an outer, continuous Lembert suture is applied. I have occasionally used clamps ; and quite well understand how they facilitate the passage of the sutures and prevent the

escape of the contents of either the stomach or the bowel, while stitching the visceral edges together. On the other hand, by obstructing the blood-vessels there is the risk, after removing the forceps, that these may bleed, and lead to loss of blood, probably into the stomach; and, also, there is the danger, as I experienced in one case, of the stitches becoming slack after the clamps are removed. The detail, however, is only one to be forewarned of, in order to be guarded against. The use or not of special appliances in the performance of the operation is purely a matter which concerns the preference of the individual operator; and is not of sufficient importance to have any weight attached to it.

After the first line of security suturing is finished, which is effected by transfixing the serous and muscle tunics of the stomach and the bowel, the marginal stitch is passed; it is continuous and made to pierce all coats, so that the vessels which have been cut by the incision are well secured by it. Any unusually large vessel should be separately ligatured. It is usual to suture the bowel to the stomach by the outer series of Lembert's to a greater length than the opening, so as to prevent the possibility of a kink both on the proximal and the distal side of the orifice.

Here let me draw attention to a detail which is of no little importance in the matter of secure suturing. The weakest point in the whole circumference of the line of union is the end of the artificial orifice nearest the pylorus—the pyloric angle. The reason for this will be best understood when it is remembered that it is the end at which the jejunum passes away to its natural position on the left side of the abdomen. Hence there is a drag at this particular point which places a considerable strain on the stitches uniting the viscera together. A glance at the diagram will at once make clear the point (*see* Fig. 27). It is here, more than at any other place in the whole circumference of the line of suture, that a leakage is most likely to happen. It occurred in one of my cases; and it is, therefore, on no mere theoretical grounds that I draw attention to it. So impressed am I with the danger that exists at this particular spot, that I believe not a few of the fatal cases of peritonitis which have occurred after the opera-

tion of gastro-jejunostomy have been due to leakage at this point.

It further raises the question of the wisdom of placing these patients after operation in the inclined position—a practice which arose out of the notion that by lowering the orifice we facilitated gastric drainage and prevented regurgitation of bile into the stomach. But such a position must increase the dragging effect of the jejunum upon the stitches at the pyloric

angle of the orifice; and the higher we raise the chest the greater naturally must be the downward pull. The best way to avoid this is to place the patient on the right side; for in the “no-loop” method of performing posterior gastro-jejunostomy there is no risk of a kink or dragging effect being produced upon the cardiac angle. This is the position in which I now place my patients, all movements from the dorsal to the right lateral position and *vice versa* being effected by

the nurse, so that by preventing voluntary actions no undue strain is brought to bear upon the abdomino-parietal wound. Such a change in the position of the patient is in keeping with the now almost universal practice of making the anastomosis as close to the pylorus as possible. When the inclined position—or as it is sometimes called the “Fowler” position—was first adopted, the anastomotic opening was made more towards the central part of the body of the stomach, and there was a long proximal limb of the jejunum. There was, therefore, some reason for placing the patient in the fixed dorsal position, and on an inclined plane. But with the modern method of procedure, if mechanical

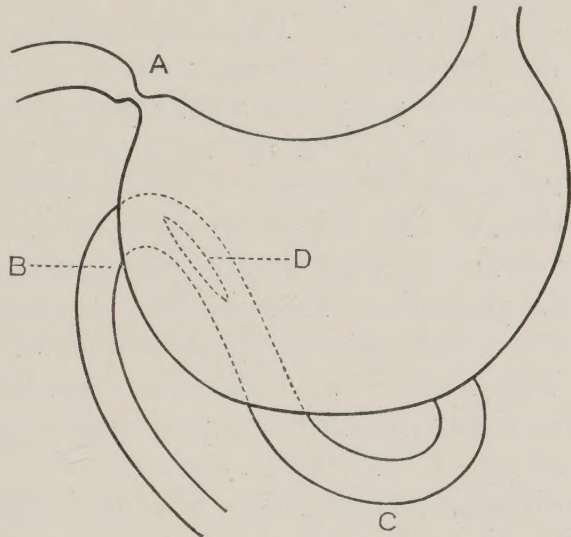


FIG. 27. “No-loop” operation of posterior gastro-jejunostomy, to show where a kink is liable to take place at the pyloric angle. A, Constricted pylorus; B, the point where the jejunum falls away from its attachment to the stomach; C, duodeno-jejunal bend; D, opening into the stomach.

considerations are to play any part in our treatment, resting in the right lateral position would seem to fulfil more efficiently the ends desired ; while to put the patient in the left lateral position would be to produce, in an aggravated degree, the very evils which we are anxious to avoid. There is little doubt that the tendency of the bowel is to drag down that portion of the stomach to which it is attached, so that in course of time it practically comes to be placed at the lowest or most dependent part of the viscus. This displacement probably explains why the anterior aperture proves as efficient for discharge and drainage purposes as the posterior.

It is very rarely now that we are troubled with the so-called "vicious circle." This is doubtlessly primarily due to the adoption of the "no-loop" operation ; and to the artificial opening being made as close to the pylorus as possible. That it does occasionally occur is probably the result of some obstruction at the anastomotic opening. Two factors are liable to so paralyse the jejunum that for a time the normal peristalsis of the attached bowel is stopped. These factors are the complete division of the circular muscle fibres for two inches or so ; and the inflammation which doubtlessly often attacks the wound and the adjoining visceral parietes. They will explain the vomiting of bile which takes place on the few days succeeding the operation. This troublesome and disagreeable symptom will, however, disappear as the inflammation subsides, and the divided muscle fibres accommodate themselves to the altered conditions. When vomiting of bile occurs some days after operation it may be the result of a slight obstructive kink at the commencement of the efferent limb of the jejunum. As the stomach is increasingly pulled down the kink straightens out, and the symptoms disappear. That an operation should be required for the treatment of "vicious circle" after the "no-loop" method indicates, as a rule, something defective in the technique of the operation.

A more remote result of gastro-jejunostomy is the formation of an ulcer either in the jejunum just beyond the line of anastomosis or at the line itself. Such ulceration may occur either after the anterior or the posterior operation. I have never met with it after the latter ; but it followed

in two cases where the anterior operation was performed. One of these, as it subsequently turned out, proved a rather remarkable instance. The patient, a woman, aged fifty-one years, was operated on for perforated gastric ulcer on February 14, 1907. On October 24 of the same year, that is, eight months after the first operation, she was operated on for a perforated jejunal ulcer situated on the anterior surface of the distal limb of the jejunum about an inch and a half from the anastomotic opening. It was closed by a purse-string suture. On November 18, 1909, that is, a little over two years after the last operation, she was again admitted to the hospital with signs of perforation. On this occasion another perforated jejunal ulcer was discovered also on the anterior surface of the efferent limb of the jejunum about one inch lower down than the first perforation. This, too, was encircled by a purse-string suture and invaginated. She made a good recovery. These ulcers were probably of the true peptic class, as distinguished from that kind of ulcer which arises along the line of union of the bowel to the stomach, and is practically the direct result of the operation.

To facilitate the nursing of cases after the operation of gastro-jejunostomy, I have drawn up a scheme for the purpose of indicating how nourishment should be administered for the first two or three weeks. Experience has taught that it is quite safe, so far as the operation itself is concerned, to commence feeding by the mouth after an interval of from twelve to twenty-four hours; indeed, when the weakened condition of the patient seems to demand it, food may be given still earlier.

I have had the opportunity of noticing how firmly glued together closely stitched peritoneal surfaces become within only two or three hours of the original suturing; and if we couple this fact with accurate stitching of the wound edges, we have little to fear from leakage. However, I prefer to wait twenty-four hours, as a rule, before inducing any contraction of the gastric parietes, and so placing tension on the line of union.

Peptonised milk forms the staple diet for the first few days; and, with but few exceptions, this medium agrees with patients, and they often like it. Occasionally, however, cases occur in which there is a positive distaste

for milk; under these circumstances it should not be enforced, but replaced by chicken tea or other fluid nourishment for which the patient may have a liking. As I have already indicated (*see* p. 113), I think the patient is often the best judge of what is most suitable for his consumption. Relish plays such an important part in successful feeding that we should always take it as a dictate of Nature's to be followed in all cases where there is no positive objection to doing so.

The scheme is not one to be rigidly followed in every instance; it is merely a help, and frequently a great convenience. Thus, we may sometimes find that the regime of the first or second day must be continued for a day or two longer; it, therefore, greatly simplifies our instructions to the nurse when we have only to say that the regime of a particular day must be repeated on one or more successive days. So, also, if the case seems to do exceptionally well we may increase the pace, skip a day or two; and so, for instance, pass from the 6th to the 8th, or the 8th to the 10th; and instead of waiting a fortnight before the period of normal diet is reached, the patient may be taking full diet on the 10th day after operation.

SCHEME OF DIETARY TO BE FOLLOWED FOR THE FIRST FORTNIGHT AFTER THE OPERATION OF GASTRO-JEJUNOSTOMY

Day of Operation

Nutrient enemata four-hourly (each enema 2 oz. of peptonised milk and 2 oz. of saline solution).

First day

8 A.M. 1 oz. of hot water.
8.30 „ 2 oz. „ „ „
9 „ 1 oz. of peptonised milk in 1 oz. of hot water.
9.30 „ 2 oz. „ „ „ „

Every two hours after, 2 oz. of peptonised milk. (One pint of warm saline solution per rectum every six hours, beginning at 8 A.M.)

Second day

8 A.M. 4 oz. of hot peptonised milk.
11 „ 4 oz. of chicken soup or beef tea.
2 P.M. Same as 8 A.M.
5 „ Same as 11 A.M.

Continue during the night as required. Rectal salines as on the first day.

Third day

The same as the second day, only that to the milk is added half a slice of bread well soaked, and to the soup a small piece of dry toast, also well soaked.

Rectal salines as required.

Fourth day

The same as third day, only that the quantities are increased from 4 oz. to 6 oz.

Fifth day

Same as fourth day, only that the quantities are increased from 6 oz. to 8 oz.

Sixth day

- | | | |
|-------|------|---|
| 8 | A.M. | Cup of tea with 8 oz. of milk sop. |
| 10.30 | „ | Cup of chicken tea or beef tea, with dry toast. |
| 1 | P.M. | Fish cream or pounded fish, bread, and 6 oz. of milk. |
| 4.30 | „ | Cup of tea, with dry toast and butter. |
| 7 | „ | Farinaceous milk pudding, with milk to drink. |

Seventh day

Same as sixth.

Eighth day

- | | | |
|-------|------|---|
| 8 | A.M. | Tea, dry toast and butter, and lightly boiled egg. |
| 10.30 | „ | Cup of soup and dry toast. |
| 1 | P.M. | Steamed fish, bread, custard pudding, and milk. |
| 4.30 | „ | Tea, dry toast and butter. |
| 7 | „ | Lightly boiled egg, milk pudding, and bread and butter. |

Ninth day

- | | | |
|-------|------|--|
| 8 | A.M. | Same as eighth day, or milk and porridge. |
| 10.30 | „ | Same as eighth day. |
| 1 | P.M. | Boiled rabbit or fowl, and farinaceous puddings. |
| 4.30 | „ | Tea, dry toast and butter. |
| 7 | „ | Chicken cream, or fish, and milk puddings. |

Tenth day

Same as ninth.

Eleventh day

Ditto.

Twelfth day

Ditto.

Thirteenth day

Fried or roasted meats (not butcher's meat), vegetables, and plain puddings.

Fourteenth day

Same as thirteenth day.

Fifteenth day

Ordinary diet at regular meal-times.

NOTE.—No patient to be awakened for feeding purposes during either the day or the night.

Some allowance must always be made for the idiosyncrasies of patients. Thus, often it happens that a patient has a dislike to peptonised milk, or an objection to soaked bread or toast ; while ordinary milk will be taken with relish, and dry toast or bread also. A nurse may always exercise her discretion in these matters, and substitute any food of a practically similar and simple character for that contained in the table. We always want our patients to take nourishment, and to relish what they take ; for nothing so conduces to sound repair and a good recovery as the proper assimilation of suitable food. Again and again, I have found the patient's own preference for certain articles of diet the best guide as to what would effect the most good.

Gastro-duodenostomy. The operation of gastro-duodenostomy, which implies the formation of a fistula bimucosa between the stomach and the duodenum, is employed only for cases of pyloric obstruction. From a purely physiological and anatomical standpoint it approaches much more to the natural processes of gastrointestinal digestion than does the operation of gastro-jejunostomy. When, however, it is considered from entirely a practical point of view, it has its limitations ; and it is these which we are forced to consider, primarily, in selecting one or other operation for any particular case. Given, then, a case of pyloric obstruction of non-malignant origin and unassociated with active ulceration, the chief factors which would determine our selection of gastro-duodenostomy in preference to gastro-jejunostomy would be the freedom with which the first part of the duodenum could be displaced downwards, and the certainty with which a sufficient length of the bowel could be obtained for union with the stomach. It is, however, remarkable how exceptional are these conditions ; for tension between the united edges of the duodenum and stomach must be carefully avoided ; and the cases are not many in which the requisite amount of relaxation can be obtained.

If, however, the pyloric orifice itself can be utilised to form part of the canal of communication between the two viscera, there is much less likelihood of tension being exercised ; and we then have a modification of the operation which renders it much more widely applicable. This

modification is known as pyloro-gastro-duodenostomy or Finney's operation, and has, when suitably applied, distinct advantages over gastro-jejunostomy. It is in reality dealing with the seat of the disease itself, and effecting a result which much more nearly approaches to the natural functions of these viscera. For, in the first place, it maintains the normal position of the outlet of the stomach; and in the second, it allows of the transit of the ingesta through the whole length of the duodenum, a physiological factor of no mean importance in its bearing on natural processes of digestion.

The cases best suited for the operation of pyloro-gastro-duodenostomy are those of congenital narrowness of the pyloric aperture, and simple uncomplicated cicatricial stenosis of the orifice.

Koch's method of performing gastro-duodenostomy—used, possibly, more frequently after excision of the pylorus and partial gastrectomy—can also be employed for non-malignant obstruction of the pylorus. It consists in cutting across the duodenum just beyond the pylorus and planting the patent distal end into the posterior wall of the stomach. The chief condition requisite for the successful performance of the operation is sufficient mobility of the first part of the duodenum so that it may be united to the stomach without tension. I have only once performed the method and cannot, therefore, say much about it. Its advantages are much those claimed for the other methods of performing the operation; but it might be considered particularly suitable for cases of active ulceration at or in immediate proximity to the pyloric aperture. The one disadvantage which possibly it possesses by comparison with other methods is that it necessarily takes longer to execute.

Pyloroplasty (Heineke-Mikulicz). I have had but little experience of this operation; and such as I have had has not encouraged me to practise it further. For in one case of cicatricial contraction of the pyloric orifice, the symptoms of pyloric obstruction recurred in the course of a few months, and necessitated a second operation. I found at the operation recontraction of the aperture, and, therefore, performed a gastro-jejunostomy. That is now more than ten years ago and the patient has not suffered

from similar trouble since. There are some who still believe in the operation ; and possibly when practised on carefully selected cases, its success may prove persistent. But the cases, I should imagine, are few where it could prove an operation preferable to pyloro-gastro-duodenostomy or gastro-jejunostomy.

Such an operation as pylorodiosis (Loretta) or forcible stretching of the constricted pyloric aperture, I have not thought it worth while to consider at any length. It was a tentative measure in the early days of gastric surgery ; and is, I believe, rarely selected in preference to the various cutting operations.

CHAPTER XIV

CHRONIC ULCER OF THE DUODENUM

PERHAPS no part of the small intestine has excited more interest within the last few years than the duodenum ; and to Moynihan, more, possibly, than to any one else, belongs the credit, of not only directing attention to a subject of considerable importance, but of throwing much light upon it, both in regard to diagnosis and to treatment.

Ulcer of the duodenum of the chronic type—and it is only with that that I intend to deal—possesses this distinctive feature, that it in every way structurally resembles the chronic gastric ulcer. That it is met with most frequently in close proximity to the pylorus, and not infrequently in association with a similar lesion in the stomach, goes unmistakably to show that whatever is the cause of the one must be the cause of the other. This pathological consideration would appear to be a factor of no small importance in attempting to seek a reason for the origin of the lesion wherever it may first make its appearance.

I do not intend to discuss the various explanations that have been given for the formation of a duodenal ulcer ; but in the light of what I have just said, it seems almost useless to ascribe a cause which cannot with equal force be held to apply to the formation of a gastric ulcer. For

instance, on these grounds it is difficult to understand how Lane's theory of an obstructive kink at the duodeno-jejunal bend can explain the appearance of a duodenal ulcer when we know that gastric ulcer may be present without any obstruction at the pyloric aperture, and with no indication that obstruction exists elsewhere. On the other hand, Moynihan's theory of a toxic cause arising out of disease of the appendix or of some other part of the intestinal canal or of other abdominal viscera would apply as much to gastric ulcer as to duodenal ulcer.

That the initial lesion is often a very minute one and acute in process seems reasonably to suggest that chemical or mechanical irritation may be at the root of many an ulcer that eventually comes to assume the chronic type. Bolton's recent investigations on the connection between acute and chronic gastric ulceration lends weight to such a theory of origin. The result of these investigations expressed in his own words is: "the acute spreading ulcer becomes a chronic ulcer" (*British Medical Journal, Supplement*, vol. ii, 1911, p. 379). It is in connection with such a consideration that the hyperacid condition of the gastric juice, usually present during active ulceration, becomes of interest; and would appear to suggest that the excess of acid acts as an irritant of such potency as to be destructive in its effect upon some particular spot of the mucous membrane.

While, then, it must remain in doubt what is the real cause of ulceration of the duodenum, there is little difficulty in understanding how, when once an ulcer has formed, the symptoms which result must depend both upon the seat of the lesion, and its character, whether active, quiescent, or healed.

In the first place, we know that given favourable conditions the ulcer will heal; and, if it has not reached any magnitude, such healing may be followed by a complete restoration of the parts to their normal functions. How many cases pursue this natural course it is impossible to say, for we have no means of determining. We can only surmise that such may have been the nature of a case in which symptoms suggested at one time duodenal ulcer, and in which the absence of any recurrence of the symptoms might indicate that it had permanently healed.

It seems, however, to be one of the peculiar features of duodenal ulcer that it may, from time to time, manifest renewed activity, and give rise to a series of typical symptoms which constitute what is termed "an attack." The intervals of time which may elapse between these "attacks" present the greatest variety; but one very striking fact is that many years may elapse between two consecutive "attacks." During these intervals the patient may enjoy good health, and be perfectly free from the slightest indication of duodenal trouble. We must conclude that all this time the ulcer has become temporarily healed; just as, for instance, we are familiar with in the case of a chronic ulcer of the leg; and like these ulcers, also, it may from some exciting cause be lighted up again. It hardly seems possible to conceive that the ulcer is merely quiescent, neither advancing nor healing. The causes which evoked the initial process may have remained in abeyance for a time; and then reappearing, awakened into activity the dormant lesion.

As already indicated, the usual association of hyperacidity while active ulceration is in progress reasonably suggests that this factor may play some causative part in the initiation and in the reignition of the inflammatory process.

These "attacks" reveal themselves in dyspeptic symptoms of a fairly distinctive type. The patient, who is more often a man than a woman, and generally somewhere about middle age, first complains of a sense of fullness or oppression in the epigastrium coming on after food, and causing him to be selective in the kind of nourishment he takes. Shortly after ingestion he may suffer from flatulency, and relieves his discomfort by belching up gas accompanied often with eructations of sour or bitter material.

The most suggestive symptom, however, is pain, varying somewhat in character but felt in the epigastrium usually to the right of the middle line, and sometimes extending through to the back. It comes on not less than two hours after food, but occasionally the interval may extend to three, four, and even six hours. Its onset is as a rule shorter after a fluid meal than after a solid one. It possesses this peculiarity also, that it is often relieved by taking food;

and from the fact that its appearance is sometimes contemporaneous with the patient's desire for food, Moynihan gave it the name of "Hunger pain." In some instances the patient will awaken in the night with the pain, and obtain relief by taking some food.

A good deal of discussion has arisen over the possible cause of the pain. That it does not arise until some hours after the ingestion of food seems to suggest that it is in some way connected with the passage of the food into the duodenum, and therefore of the contact of the former with the ulcer; but whether it is the mechanical irritation of the ulcer by the passage of the food over it or the chemical excitation of the acid gastric juices, it is impossible to say. In favour of the latter, however, is the statement so frequently made by patients that a dose of carbonate of soda at once relieves the pain. This looks very much as if the acid gastric secretion had something to answer for, because the principal affect of the carbonate of soda must be to neutralise this acidity. That the pain should vary in intensity, duration, and distribution seems reasonable on the basis of comparison with what we know about ulceration in other parts of the body. When an ulcer becomes inflamed its sensitiveness is increased; and when the necrotic process lays bare certain nerve fibres its response to excitation is grossly augmented. Thus, then, it is not difficult to understand how variable are likely to be the clinical manifestations of duodenal ulcer.

Similar pathological considerations seem to explain also the existence or not of hæmorrhage as a symptom of duodenal ulcer. The presence of blood in the stools or in the vomit, as well as its amount, are almost entirely matters of accident. For it pretty much depends upon whether the necrosis only opens some small capillaries, or whether some of the larger vessels have been eroded. We may, however, rightly conclude that when the loss of blood is large the ulcer must have extended sufficiently deep to open one of the trunk vessels, and that this should happen necessarily locates the ulcer at some part of the circumference of the bowel other than that of the anterior surface. I cannot give facts in support of the supposition, but it seems likely that the nearer the ulcer is to the pyloric aperture the more likely it is to be disturbed by the

contractions and relaxations of the pyloric sphincter. This might prove a source of both augmenting the pain and increasing the hæmorrhage.

The pathological condition of the ulcer must still further be held responsible for the presence or not of any physical symptoms. As the pain is principally "referred" it is only likely to be present when the process of ulceration is active, or when the ulcer is being unduly excited or stimulated. Thus, then, when in a quiescent state—or, as is more probable, in a temporarily healed condition—there will neither be tenderness on palpation of the right epigastric region nor hyperalgesia of the skin over the same area; but under opposite conditions not only will such symptoms be present, but, added to them, the upper part of the right rectus will be rigid; and any attempt at deep pressure will be resisted. These physical signs will be increased if the inflammatory process in connection with the ulceration has invaded the peritoneal surface, as it may easily do, when the lesion is situated on the anterior wall of the duodenum.

The remarks, however, in this chapter are not intended to embrace the various symptoms associated with the later complications arising from the deeper advance of ulceration; nor with those which ensue from the contractions and adhesions consequent on the healing of the ulcer. I am solely dealing with uncomplicated ulceration: with that condition, indeed, which we are anxious to diagnose and treat before any such complications arise.

From the symptoms thus given it may be fairly concluded that, in the majority of instances, the diagnosis of duodenal ulcer is not difficult; but whether additional experience will enable one to reach that ideal of accuracy which Moynihan claims to have attained remains to be seen. There certainly seem to be cases which occasionally fail to reflect symptoms suggestive of the disease; and others again, not duodenal in origin, which nevertheless present symptoms indicative of that disease. In the large majority of cases, the history of the complaint—so far as duodenal ulcer is concerned—will throw more light on its true nature than the presence of physical signs.

I come now to the question of treatment. That a duodenal ulcer can heal indicates sufficiently that Nature

is capable of exercising the necessary recuperative powers provided the cause of its production be removed, and any exciting agencies to its continuance and increase in like manner overcome. We know that an ulcer of inflammatory origin wherever situated will heal if the part which it attacks can be kept at rest, and all sources of foreign irritation be removed from its surface. The difficulty in the case of a duodenal ulcer is to accomplish these ends, for we can neither prevent movement of the duodenum, nor can we protect its surface from the intermittent passage over it of both mechanical and chemical agents. But knowing that these are the objects to be aimed at, we can certainly do much to lessen their detrimental effects.

A patient, therefore, who, for the first time, complains of dyspeptic symptoms which carry with them the faintest suspicion of duodenal trouble, should be carefully dieted; and especially should all foods, whether of a solid or fluid consistency, which tend to cause acidity, be forbidden. The acidity should be combated with drugs capable of reducing or neutralising it. Simple precautionary measures of this character will usually succeed in curing the initial attack; but a patient, who has once thus suffered, should continue to exercise care in regard to diet, and be given to understand that he possesses a proclivity to a disease which, without such persistent precautions, he will possibly suffer from again with increasing severity with each recurrent attack.

A second attack, occurring at no matter what interval after the first, may be regarded as a fair indication that the disease has now obtained such a hold on the patient that more radical measures are required for its cure than can be effected by simple conservative means. And it may also be reasonably concluded, as in the case of inflammatory affections of other intra-abdominal viscera, like appendicitis, cholecystitis, &c., that every succeeding attack leaves the patient with a more advanced lesion, and with an increased tendency to the manifestation of other complications which sooner or later may lead to serious, if not fatal, results. I think, therefore, that the feeling is growing in the profession that a second attack of duodenal ulcer indicates the advisability of operating; because there is now quite sufficient evidence to show that operation

can not only afford immediate relief, but effect a perfect cure.

I need not enter into the rationale of the treatment which practically carries out the two principal ends required in regard to the ulcer, that is to say, the ulcer is given rest by diverting the food away from the duodenum, and by neutralising the hyperacidity. Both these ends are acquired in the performance of gastro-jejunosomy. There are, however, various points to consider regarding the best operative methods to adopt in the varied phases which the lesion may present. And here I would, in the first place, draw a very sharp line of demarcation between ulcers that have not caused hæmorrhage and those which have given or are giving rise to free and copious bleeding.

In the former class—non-hæmorrhagic—if the ulcer is small, accessible, and easily removable, it should be excised; and the usual “no-loop” method of posterior gastro-jejunosomy performed. If excision be not effected, the base of the ulcer should be encircled, if it is possible to do so, by a purse-string suture sufficiently deeply passed to constrict any vessels proceeding to the floor or margins of the ulcer; and gastro-jejunosomy performed as in the previous case. When the ulcer is inaccessible or too large for local treatment, or too involved in adhesions, gastro-jejunosomy may alone be depended upon.

In the latter class—hæmorrhagic—there is little doubt that all possible contact of the gastric contents with the ulcer must be prevented; that is to say, the pyloric aperture must be occluded. The need of this precaution was very poignantly brought home to me some years ago in the case of a medical man who had had one or more very severe hæmorrhages from a duodenal ulcer. I simply performed gastro-jejunosomy. For a few days he did well; then he had blood in his stools, gradually got paler, and two days after the first appearance of the melæna he was suddenly seized with all the typical symptoms of a large loss of blood, and died. The lesson so learnt had, in the course of a few weeks, soon its application; for strangely enough, another medical man with precisely similar symptoms of repeated hæmorrhages came into my hands for treatment. Prior to performing the “no-loop” opera-

tion of posterior gastro-jejunostomy, I cut through the stomach just proximal to the duodenum, and closed both orifices. And now, after an interval of some years, there have never been the slightest symptoms connected with the ulcer. I have performed the same operation since for similar conditions ; and although the method must give the duodenum rest very effectually by preventing any continuity of peristalsis from the stomach to the duodenum, it possesses one slight disadvantage, and that is, that the stomach loses to some extent the suspensory action afforded by the more or less fixed pylorus. The whole weight of the stomach and the attached jejunum must be borne by the gastro-hepatic or lesser omentum ; and this, it is quite conceivable, will not prove sufficient to prevent a considerable prolapse of the stomach, and more particularly of the pyloric antrum. So far as I know no ill effects have followed this downward displacement ; but it seems right to direct attention to it.

Another way to effect occlusion of the pyloric aperture, and one which occupies much less time, and involves no possible displacement of the viscus, is to encircle the pylorus with a silk suture the tying of which constricts the canal. The only theoretical objection which this method seems to have is that, as I have already indicated, it may not check the onward peristaltic movement of the stomach into the duodenum ; and so afford that mechanical rest to the ulcer, which is ready to bleed at the slightest provocation ; but, as I know from personal application of the method, it so materially shortens the operation, that where rapidity of execution is a matter of moment, I should not allow theoretical objections to stand in the way of its adoption.

In a paper recently published by Moynihan (*Lancet*, vol. i, 1912, p. 9) attention is drawn to the bearing of the appendix on the production of ulcer of the duodenum. As it affects the question of treatment, I give the following short extract. "It is essential in all cases of duodenal and gastric ulcer, when the condition of the patient warrants it, that the appendix should be excised. The frequency with which it is grossly diseased is astonishing" . . . "I, therefore, make it a practice, with few exceptions, to examine and remove the appendix in all cases of gastric

and duodenal ulcer, and of gall-stones." The reason given for this practice is based on the theory that, "If it is admitted that the hypothesis connecting the onset of a duodenal ulcer with the chronic infection discovered in the appendix is supported by the evidence, then it must also be conceded that the incident of a jejunal ulcer may in like manner be determined by the continuance of that infection when the appendix is allowed to remain."

I hesitate, somewhat, to venture upon a criticism of the opinion of so good an authority on the subject ; but I must own to a feeling of some difficulty in tracing the connection between such simple appendical lesions as are depicted in the paper from which I have taken the extract, and the formation of a gastric or duodenal ulcer. The simple lesions of the appendix there shown are common enough, and their frequency out of all proportion to the occurrence of either gastric or duodenal ulcer. The association seems more coincidental than causative. But, doubtlessly, as time proceeds and experience increases this suggested relationship, if it really exist, will be proved.

I may conclude these remarks on the surgical treatment of simple uncomplicated cases of chronic duodenal ulcer with the encouraging statement that, in experienced hands, the rate of mortality does not exceed 2 or 3 per cent.

Perforation of a Duodenal Ulcer. The only late complication to which I shall briefly refer is that of perforation. The sudden, acute, prostrating onset is always sufficiently indicative of a grave crisis ; and the difficulty usually lies not so much in diagnosing a possible perforation as in determining its connection with a duodenal ulcer. For an ulcer to reach the perforating stage—and I am now dealing exclusively with an ulcer that suddenly opens into the general peritoneal cavity—there have probably existed symptoms which, when carefully considered, create a very strong, if not certain, clue to the true seat of the lesion. Again, if the case is seen sufficiently early before general peritonitis has set in, there is frequently an area of tenderness over the right epigastric region which renders it probable that the perforation is in the duodenum.

Taken as a whole, the initial symptoms of a perforated duodenal ulcer are not so acute as in the parallel example of a perforated gastric ulcer. I have, for instance, known

a man walk into the hospital with a perforated duodenal ulcer. This contrast, however, must not be depended upon for differential diagnostic purposes.

As regards treatment, all that has been said in connection with a perforated gastric ulcer might be repeated here. In quite the majority of cases the simplest, safest, and most expeditious method of dealing with the lesion is to encircle it with a purse-string suture, and to supplement this either by a second series of Lembert sutures over the invaginated perforation, or to stitch over the part a layer of omentum. It is essential that the opening should be securely occluded ; and as some of the purse-string sutures may cut their way through the œdematous tissues, a protective covering of either over-folded bowel wall or omentum is necessary.

It is wise to leave the performance of gastro-jejunostomy for a later period, supposing it should appear necessary, for such an operation involves time and much manipulation of the parts ; and in the circumstances in which operation is undertaken the shorter the time the patient is under the added depressing and toxic influences of the anæsthetic the better. As in the case of perforating gastric ulcer, success mostly depends upon the shortness of the interval between the operation and the perforation. The results are excellent when the case can be treated before general peritonitis has commenced.

CHAPTER XV

ACUTE ABDOMINAL CRISES

MY object in this chapter is to present a clinical picture of a class of cases which have come to occupy one of the most prominent, as well as one of the most important, places in the whole domain of surgery.

If we study the subject from the standpoint of the text-book, we read of the existence of a particular pathological lesion which has caused certain striking and distinctive symptoms demanding prompt and clearly indicated treatment. But, if we view the matter from

the appearances it primarily presents to the clinician, we are confronted with a display of acute symptoms which require, first, a correct appreciation of their significance, and only, second, the possible nature of the lesion producing them.

Both aspects of the subject are of equal importance, because the more perfect our knowledge of the one the more practical and useful our position in the other. If, to take an example, I know from previously acquired theoretical knowledge that a perforated gastric ulcer produces certain symptoms, I shall be able to state that these symptoms when I encounter them in a given case are caused by such a lesion. Indeed, it is imperative that I should be as familiar as possible with the acute symptoms that arise from every known condition capable of producing a crisis; for, it is only by the possession of such knowledge that I shall be properly prepared to form a correct diagnosis or to adopt the requisite treatment. Nevertheless, however complete and comprehensive our book knowledge, it is totally another matter when we stand at the bedside of a patient who has been suddenly seized with acute abdominal symptoms.

The first problem, then, to solve is not what has caused the crisis, but are the symptoms such as to demand operative intervention with the least possible delay.

If every lesion which produced an acute crisis was followed by a distinct and clearly differentiated set of symptoms little difficulty would be encountered in ascribing to such symptoms their true cause; but unfortunately such is not the case. The real facts, on the other hand, are that more than one lesion is capable of being represented by similar clinical manifestations. To spend time, therefore, in seeking to ascertain the cause when the immediate consequences are so grave as to need prompt operative treatment is to court, in many cases, ultimate failure; especially, too, is this the case when it is remembered that in some instances a diagnosis is not possible until the abdomen has been opened.

It must not be understood that I am in any way deprecating the employment of every legitimate means to ascertain the cause of the acute seizure. What I am striving, first, to enforce is that such means or efforts must not stand in the way of our deciding at the earliest

possible moment the performance of an operation ; and, second, to inculcate a line of action that will lessen that deplorable and still too frequently met with series of cases which have been wont to be classified as "Too Late."

How valuable it is to know the cause of a crisis is sufficiently attested by the aid it affords us in proceeding by our operation direct to the seat of the lesion. To know definitely, for instance, that the symptoms indicate a perforated gastric ulcer is to give us a convenient guide for the place best suited for the exploratory incision ; but it must be equally borne in mind that we do not absolutely need distinctive symptoms ; for, we should certainly find the lesion although we had previously possessed no knowledge of its existence ; and to delay operation because we were striving beforehand to locate the cause of the crisis would be a grave miscarriage of our duty in the proper treatment of the case.

The importance of promptitude in operative measures, in the class of cases to which I am now alluding, is borne out by the fact that, with few exceptions, an otherwise necessarily fatal result is for certain prevented by the timely intervention on the part of the surgeon. Surgery fails in its efforts directly in proportion to the length of time that intervenes between the initial seizure and the execution of the operation. Hence the supreme importance of deciding at the earliest possible date that the crisis is one to be treated surgically.

Let me now indicate what are the crucial points upon which a definite decision is arrived at—that the case is one requiring prompt surgical treatment.

First and foremost, the symptom of pain should be considered. There is not a single abdominal crisis, in the particular class of cases under discussion, that does not commence with an attack of acute prostrating pain ; a pain so sharp, cutting, and severe that, if it does not actually make the patient vomit, at least causes a sense of nausea. The physical results are such, that the patient may be "doubled up," as he often graphically expresses it, and is compelled to desist from whatever he may be doing, and resort to the recumbent position. The severity of the seizures may be such as to cause pallor, and even beads of perspiration on the forehead.

It is only occasionally that the medical man is in sufficiently early attendance to see these symptoms in the acute initial stage; and still more rarely does it happen that the surgeon, who may be called into consultation, is afforded a like opportunity. But the story in itself is sufficiently certain and reliable to render unnecessary its enactment before the eyes of the clinician for any confirmatory judgment. And I do not hesitate to say, that such symptoms suddenly arising in an apparently otherwise healthy man or woman imply that in nineteen cases out of twenty, if not even at a numerically higher ratio than this, the patient should be operated upon as soon as possible. Even assuming that occasionally a mistake has been made and the abdomen needlessly opened, the good that would follow, in the overwhelmingly large majority of cases, would far and away outweigh the mistaken intervention of the surgeon in what must be only an occasional and solitary instance.

Let me continue the clinical picture or position still further. We stand at the bedside of our patient; and although we have not seen the initial symptoms in their gravest manifestations, there will almost certainly linger behind certain aspects of them which tend to confirm the suspicions already aroused. What we see and can elicit will depend largely upon the interval of time that has elapsed since the patient was first taken ill; but whatever that interval, we shall be impressed by the general appearances of the patient; that he is ill and presents indications of more or less shock to the nervous system. There may still exist, although in a modified and lessened degree, some of the symptoms with which the attack commenced.

Although fully satisfied that the abdomen should be opened without delay, we shall instinctively turn our thoughts to what is the nature of the cause that has produced the crisis; for the previous knowledge of what to expect, as I have already indicated, is no small matter in determining the particular course to pursue in operating.

So, then, we have stored in our minds, as a preliminary aid to diagnosis, the various possible sources of an acute crisis. We think of the following: A perforated gastric or duodenal ulcer; perforation of the appendix; acute

intestinal obstruction ; a ruptured ectopic pregnancy ; an acute pancreatitis—one or other of these will constitute by far the largest majority of cases met with. But there are other accidents, of a similar grave nature which, though by comparison to those given, are rare, must, nevertheless, be borne in mind. Such are a pneumococcic peritonitis ; the sudden perforation of a tuberculous or cancerous ulcer of the intestine ; the rupture of an abscess into the general peritoneal cavity, such as might arise from a pyosalpinx, a suppurating ovarian cyst or uterine fibroid, a suppurative appendicitis, &c.

With a mind, then, well stocked with possibilities, we proceed by methods of direct investigation to differentiate ; and both by positive evidences and processes of exclusion, to arrive at a diagnosis.

To make this part of the clinical procedure clear, I must take each lesion separately and indicate the signs we may expect to be present and the information we may be likely to obtain if it is the cause of the crisis. I use the word “expect” with considerable reserve, because we are so frequently confronted with cases where at the operation our expectations fail to be realised, and we find what we did *not expect*. Thus, over and over again have I known a supposed perforated gastric ulcer turn out to be a perforated appendix. So, however clear it may all seem when theoretically considered, it is often by no means so evident when we come to deal with the matter practically.

The difficulties of differentiation are frequently greatly increased when some hours have elapsed between the first investigation of the case and the sudden onset of the symptoms ; this is because a fresh set of symptoms have arisen more or less common to two or more lesions. Thus, acute general peritonitis will rapidly follow on any rupture or perforation into the peritoneal cavity ; and the symptoms which then appear will entirely mask others that at an early stage would have conveyed useful and certain information.

Apart, then, from considerations connected with the later symptoms arising from acute general peritonitis, we may regard the following signs and information suggestive of the nature of a particular lesion ; and first let us consider perforated gastric ulcer.

Perforated Gastric Ulcer. Our patient will probably be a woman, perhaps anæmic in appearance, between the ages usually of twenty and forty. We may learn from the history of the case that she has, from time to time, suffered from dyspeptic symptoms; and at one time there may have been an attack accompanied with hæmatemesis which gave rise to a definite diagnosis of gastric ulcer requiring prolonged treatment of rest and careful dieting. It may further be elicited that, immediately prior to the sudden seizure, there had been premonitory indications of gastric disturbance, such as flatulence, acid eructations, and epigastric pain after food. Such a history is of paramount diagnostic significance. Then, we may be told that when the pain started it was definitely felt at a particular spot in the epigastric region; and when we come to examine the region by palpation we may find a distinct area of increased tenderness. The elicitation of such information may be fairly regarded as rendering practically certain the diagnosis of a perforated gastric ulcer.

Perforated Duodenal Ulcer. Our patient will probably be a man between the ages of twenty and forty, perhaps with every appearance of robustness. He may give a history of having had attacks of dyspepsia consisting of flatulence, acidity, and pain coming on from two to four or five hours after food, frequently relieved by taking food. These attacks may only have taken place at long intervals of time; and that between the attacks he had had good health, and taken his food without discomfort. When troubled with pain, he may indicate that it was felt in the epigastric region slightly to the right of the middle line. He may further indicate that when seized with the acute pain which accompanied the onset of the crisis, it was first felt in the epigastric region, and palpation of the part may give evidence of increased tenderness. These latter signs, however, are, as often as not, absent; and depend possibly more upon the seat of the ulcer than upon its actual perforation.

Perforating Appendicitis. Possibly few problems are more perplexing to solve than those dependent on the sudden perforation of an appendix. From childhood to old age, in both sexes, none is exempt from the possible

rupture or perforation of an appendix. There may have been symptoms of pain or discomfort in the right iliac region; and if a history of such can be elicited, some reasonable suspicion may be entertained of the true nature of the accident. But such information is frequently not forthcoming. The initial acute pain is usually first felt in the region of the umbilicus; but as this accompanies other acute intestinal trouble, it is in no sense pathognomonic. Possibly, the most distinctive symptom, when we are able to elicit it, is tenderness on palpation of the appendical region. I use the term "appendical region" in its broadest sense, because it does not necessarily imply the right iliac fossa. If, for instance, the appendix lay well over the brim of the pelvis there may be no tenderness in the right iliac region; but if we examine per rectum or per vaginam we may evoke distinct evidences of pain on pressure either backwards or upwards into the pelvic cavity. Sometimes this will be better evinced by pushing up the cervix and so causing the fundus of the uterus to impinge upon the inflamed organ and the peritoneum involved around it.

In the case of children, the perforation is frequently dependent on the pressure effects of a concretion which may never previously have given rise to symptoms, and only by a slow process of necrosis of the walls of the viscus has it caused the perforation. With children, the temperature very rapidly rises under the slightest inflammatory provocative; and I believe, therefore, a rise of temperature may be taken as a very reliable sign of this particular crisis in early childhood; especially so, if, by a process of exclusion, we cannot fix on any other possible explanation of the symptoms.

But these remarks might almost with equal force be applied to the case of many adults; for while the positive evidences are often so vague and imperfect, the absence of other conditions would admit of a diagnosis being made on little more than the score of probabilities. Indeed, I am accustomed to say to my assistants, that when in doubt as to the cause, never leave out of consideration the possible existence of appendical mischief.

There is one complicating and misleading factor which is worthy of note in considering these cases, and that is,

that not infrequently a previous history of gastric derangements is obtained. This may quite readily lead to an examination of the stomach in the belief that an ulcer has perforated. But should the mistake be made, and the stomach found intact, the appendix should be examined before the abdomen is closed.

Acute Intestinal Obstruction. If our patient is a baby or a child we may be pretty certain that the obstruction is due to an intussusception. It must, of course, be assumed that in considering the causes of the acute crisis, we have eliminated acute perforative appendicitis; for, as just indicated in the foregoing remarks, that is always a possible lesion in young children.

There is nothing distinctive in the general condition of these young patients; not infrequently they are plump and robust, and never had other than the best of health. When once, however, the blockage has taken place, they rapidly manifest constitutional symptoms. The constant pain from which they suffer, itself the result of a segment of bowel striving to overcome the obstruction, makes them very fretful and irritable. Vomiting and disinclination to take food very rapidly has its depressing and weakening effects.

It is, however, the local symptoms that are practically confirmatory of the nature of the lesion. There is usually no pain on palpation of the abdomen, and a lump may be distinctly felt, traceable often for some distance along the course of the colon. If it has advanced sufficiently far, it may be felt per rectum. The presence of slime and blood in the stools—added to the above symptoms—makes the diagnosis complete. I have known practitioners hesitate to make a rectal examination without the administration of an anæsthetic. As a matter of fact, if the finger be well lubricated with oil or soap, and slowly introduced, the sphincter very readily relaxes, and the child seems to tolerate the examination with but little evidence of physical discomfort. It is sometimes astonishing how completely it is possible to examine the whole abdomen of a baby or young child with one finger in the rectum and the other hand placed on the abdomen. An intussusception which cannot be distinctly made out by simple surface examination may, by this bimanual method,

be easily felt, and its dimensions gauged. Indeed, so certain is the detection of an intussusception by this means, that the mere passage of blood and mucus by the rectum should not be taken of itself as a sufficient justification for operation unless coupled with the tangible evidence of a tumour.

When we come to consider the question of acute intestinal obstruction in the adult, we are confronted with many more causes than in the case of a child. And, first, as to the symptoms of the obstruction.

But here let me interpolate, and emphasise, that, as we view our patient, our chief concern is not the cause of the obstruction; but that *it is* obstruction which we have to deal with. For once we are convinced of that, the abdomen must be opened, and the obstruction, whatever it may be, removed.

The initial pain is almost always in the umbilical region; and although it eases off as time proceeds, it remains varying in constancy and degree. The variations are to a considerable extent dependent on the seat of the obstruction, whether high up or low down; and, indeed, it may be said in general that obstructions high up in the intestine are much more severe in all their manifestations than those low down. Another factor, too, which affects the symptoms, is the age of the patient; in old age they may so subside as to mislead into the belief that the obstruction has been relieved.

We may ascertain that, since the initial seizure, neither *faeces* nor *flatus* has been passed.

When we come to examine the patient, we usually find that the abdomen may be freely palpated, and that pressure, rather than causing pain, may often afford relief. Some distension of the abdomen may have commenced, and the presence of *borborygmi* noted. There is no rise of temperature, and the pulse for a time may show no marked change, but gradually it may be quickened and diminished in tension. Vomiting and nausea will persist; but, at first, little more than the contents of the stomach tinged with bile will be ejected. With such symptoms as these, we may rest assured as to the correctness of our diagnosis of acute intestinal obstruction.

Now, as to the probable cause, which, however, as I

have already indicated, may not be ascertainable until we have opened the abdomen. But often we may obtain a distinct clue in carefully weighing the history of the case.

We shall have in our mind the following possible causes : a fibrous band constricting the bowel, or beneath which a loop of intestine is strangulated ; adhesions kinking the gut ; an internal hernia, that is, a loop of bowel slipping into one or other of the many peritoneal pouches or fossæ that exist within the abdomen, and becoming strangulated ; a Meckel's diverticulum producing a similar effect to a fibrous band ; the impaction of a gall-stone in the small intestine ; the sudden blockage of a stricture in the small intestine or colon ; a sudden twist of the bowel.

While the causes, thus, are seen to be many, the signs and symptoms which will enable us to distinguish or differentiate them are few. Perhaps the most suggestive history we can obtain is that which tells of some earlier abdominal trouble like peritonitis, itself the sequel, possibly, to some local inflammatory mischief. Any such information would lead us to suspect adhesions or fibrous bands of some shape or form. Then, if we learn that at some comparatively early period of life the patient had suffered from prolonged and intractable diarrhœa we might reasonably think of a tubercular lesion, either of the nature of a tuberculous stricture the result of a healed tuberculous ulcer, or of adhesions. Such records of past abdominal or intestinal disturbances have a greater significance when occurring in young adults.

If our patients are past middle life, and verging on old age, we think of obstruction from malignant disease ; and in these cases we frequently get a history of chronic constipation, and of intermittent attacks of colicky pains. Volvulus, also, is more frequently met with in later than early life.

I think, however, if we consider acute intestinal obstruction in a general way, it more frequently happens than not, that we do not discover the real nature of the obstructing lesion until we have opened the abdomen ; certainly, in many cases it is quite impossible to do so ; and we can, at the best, only base our diagnosis on probabilities and not on obvious facts.

Ruptured Extra-uterine Pregnancy. It would hardly seem possible that a lesion so distinct in its characters could be mistaken for anything else ; yet I have known and experienced myself how the discovery of a ruptured ectopic pregnancy on opening the abdomen has come as a surprise, and altogether apart from the expectations regarding the probable nature of the acute crisis.

There are, however, a few very suggestive signs whose presence render diagnosis sometimes almost certain. Thus, the accident is by far most frequently met with in young married women who have not given birth to their first child. They may have enjoyed, previous to the seizure, perfect health ; although cases occasionally occur in which there have been premonitory symptoms in the way of pain in the lower abdomen suggestive of hæmorrhage slowly taking place into the pelvic cavity from the distended Fallopian tube.

When we come to examine these patients we may be struck by their great pallor, by a full but weak and rapid pulse, by a lowered temperature, and by other signs of great and rapid loss of blood. There will be marked tenderness to palpation of the lower abdomen in both hypogastric and iliac regions ; and when we examine per vaginam, marked pain, quite acute in character, will be experienced when the cervix is suddenly pushed upwards. This last symptom, taken in conjunction with those already given, renders the diagnosis practically certain.

Acute Pancreatitis. Of all the conditions that may give rise to an acute abdominal crisis none is likely to afford greater difficulty in diagnosis than acute pancreatitis ; indeed, it is questionable whether, at present, there are any symptoms sufficiently distinctive to enable us to locate the lesion with certainty before opening the abdomen. The general external signs are those of acute peritonitis with, therefore, marked rigidity of the parietes, and tenderness, especially over the epigastric region.

Immediately, however, the peritoneal cavity is opened, a serosanguineous fluid exudes ; and, if with this is seen evidences of fat necrosis—as indicated by small yellow spots in the omentum, mesentery, and other fatty tissues—it may be taken for certain that the pancreas is the seat of the lesion.

Regarding the exact nature of the lesion, we shall not have a knowledge of it until we explore the organ ; and then we may find that the gland is either pervaded with blood, or with pus, or is actually gangrenous. It is probable, as pointed out by Körte in one of the most recent and valuable contributions on the subject (*Annals of Surgery*, 1912, Part 229, p. 23), that these pathological conditions of the organ are not separate and distinct affections, but merely processes at different stages in the course of an acute inflammation of the viscus. If this be so, it suggests the supreme importance of dealing with the crisis at its earliest possible stage.

Rarer Causes. As enumerated above, there are rarer causes of the crisis which, as a rule, present various earlier symptoms that may be sufficiently clear in themselves to suggest what has taken place. Thus, tuberculous ulceration of the intestine is usually met with in early adult life, and will almost certainly have given previous symptoms of chronic or intermittent obstruction coupled possibly with an early history of intractable diarrhœa. Carcinoma of the bowel, which is a contingency mostly of late adult life, will similarly, though not necessarily, have been the cause of chronic obstruction.

A collection of pus, whether within an appendix, a gall-bladder, a Fallopian tube, an ovarian cyst, or a uterine fibroid, not to mention other possible places, suddenly bursting into the general peritoneal cavity, will almost always have been preceded by symptoms and physical signs more or less suggestively associated with the part pathologically concerned. But, simple as it may appear when thus considering the subject on paper, it is far from being so in practice ; and it will probably more frequently happen that we shall have opened the abdomen only to find, for instance, that instead of our expected lesion we encounter one that was totally unexpected. We may have passed through our minds, as we thought, every possible cause for the crisis ; and yet find that a thrombosis or an embolism of the mesenteric vessels, or a twisted ovarian pedicle presented which had never entered into our calculations.

Treatment. I am not going to enter into the various details required to be carried out prior to our opening

the abdomen. They have already been fully discussed in a preceding chapter (*see* p. 65). We are now supposed to be in the position either of having diagnosed definitely the lesion which is the cause of the crisis, or of being only suspicious of its nature, or of feeling absolutely ignorant of it.

For the purpose, however, of focussing our line of procedure, I assume, in the first place, that we are operating only a few hours after the initial seizure ; and, therefore, before complications have set in which would require more extended considerations ; and, in the second place, that we have discovered our lesion ; and, therefore, proceed at once to deal with it.

I take the various lesions in the order in which I have just discussed them ; and, to save repetition, I shall merely refer the reader to those accidents the treatment of which has already been fully described elsewhere.

Perforated gastric ulcer will be found dealt with in detail on page 136 ; similarly, the treatment of

Perforated duodenal ulcer will be found fully discussed on page 215.

Perforated appendix is treated in connection with the general subject of appendicitis in chapter xvii.

Acute intestinal obstruction, depending as it does upon so many causes, necessitates a separate consideration of each of them. And, first, we may deal with *acute intussusception*, that particular type of the lesion most frequently met with in children.

I dismiss briefly, as practically unworthy of attention, those conservative measures in vogue when abdominal operations were not so safe and certain as they are at present. I refer to massage of the abdomen, inflation of the bowel from the rectum, or the injection of water. These may sometimes succeed ; and may still be attempted where conditions are such as render operation practically impossible. But they so frequently fail, and often delude into the belief that reduction has been effected, that to substitute such measures where operation is practicable, is to risk failure when success might have been certain.

As expeditiousness in the performance of abdominal operations upon children is important, a median incision should be made. If the case has been caught sufficiently

early, reduction may prove quite easy ; and the operation completed in a few minutes. Reduction should be effected by gently squeezing back the intussusceptum ; and, as the neck or point of entrance of the invagination is approached, slight traction may be exercised on the entering bowel. This part of the operation may often be carried out without delivering the intussusception from the abdominal cavity. Should the outer serous tunic, that is, the peritoneal covering of the intussusciens, show any rupture or splits from over-distension, such lesions should be carefully stitched up. It has been suggested that in order to prevent any possible future reproduction of the intussusception, a fold or two of the mesentery should be gathered up and secured so as to shorten the membrane, and thereby inhibit the re-entrance of the bowel. Recurrence, however, is so rare that it is doubtful whether the extra time, even though little, which such a process would entail, is worth incurring.

Occasionally we shall be confronted with cases where reduction cannot be thus simply effected. We are then driven to practise one of two alternatives. We can leave the intussusception alone, and short-circuit by lateral approximation of two portions of the bowel proximal and distal to the lesion, thus relieving the obstruction, and leaving Nature to separate the intussusceptum.

The other alternative is excision of the involved bowel. This is best done by making a longitudinal incision in the wall of the outer tunic or intussusciens as near as conveniently possible to the commencement of the invagination, withdrawing the intussusceptum through the opening, and then, after cutting it off, uniting the two orifices by Maunsell's method of intestinal suture. On returning the parts thus united, the incision in the bowel is closed. It need hardly be said that the mortality in these cases is very high. Nevertheless, operation holds out the only chance of life ; and that success does occasionally follow our efforts is sufficient justification and encouragement for our making the endeavour. Excision of the whole intussusception, by whatever method the anastomosis be effected, is extremely fatal.

The abdomen can be quite safely and securely closed by a single series of through-and-through silkworm-gut

sutures. Serial suture of the parietal wall takes time ; and in the case of children, the single series of interrupted stitches proves quite sufficient.

If we discover that obstruction is due to a *fibrous band*, a *Meckels diverticulum*, or an *appendix epiploica* constricting the bowel or strangulating a loop of intestine, simple division of the agent may be all that is required. If, however, the band, diverticulum, or epiploical appendix be of any length it should be cut off close to the places of attachment, and the intervening portion removed, so that a free tag be not left to reunite with other structures, and thus render possible a recurrence of the accident. Of all kinds of obstruction, if taken sufficiently early, this proves the most successful to treat.

Should our investigation reveal *kinking of the bowel from adhesions*, we have a much more formidable condition of matters to deal with. It may not be difficult to liberate the involved parts and so remove the obstruction ; but to prevent the parts from coming together again and the adhesions re-forming may prove a problem by no means easy to solve. The latter consideration touches the subject of adhesions generally ; and as this has been dealt with at considerable length elsewhere, I must refer the reader to that particular section for the information necessary to meet the situation (*see p. 97*).

If *internal hernia* be found to be the cause of the obstruction, the liberation of the loop of engaged bowel may be all that will be required. If strangulation has led to such impairment of the part that recovery of function is not possible, it must be treated on the same lines as would be adopted in the case of an ordinary strangulated femoral or inguinal hernia ; that is to say, the segment of damaged intestine must be freely excised.

Should an *impacted gall-stone* block the intestine, an incision over the stone and its extraction may be all that is required. If, however, the impaction has led to serious damage of the bowel wall, it is safer to excise the injured segment, and re-establish the continuity of the canal by end-to-end union or lateral anastomosis.

In cases where we find that obstruction has been caused by the sudden *blockage of a tuberculous stricture*, it will be wiser, in the first place, to consider only the question

of relieving the complete obstruction rather than contemplating any more extensive measures of preventing, by excision of the part, any possible recurrence of the accident. The toxic effects which invariably more or less accompany, or rapidly follow upon, the obstruction have a very unfavourable, indeed often fatal, influence upon operations requiring plastic procedures; such, for instance, as is entailed in the removal of parts of the intestine and the re-establishment of the continuity of the canal. Operations of this more extensive nature should be left until the patient has recovered from the effects of the acute obstruction. Our treatment, therefore, should consist in securing a distended loop of intestine above the seat of the block, and making a fæcal fistula.

The above remarks apply with equal force to cases of acute obstruction arising from the sudden *block of a carcinomatous stricture*. As the obstruction in these cases is usually in the large intestine the fistula made is generally with some part of the colon proximal to the block; and not, as in the previous instance, with, as a rule, the small bowel.

The last cause of acute intestinal obstruction, of those to which I have more particularly drawn attention, we may find to be a *volvulus* of some part of the small or large intestine. The reposition of the part may need nothing more than an untwisting either of the mesentery or mesocolon, or of the bowel itself which has revolved on its long axis. It will be wise to place a stitch or two in the stretched and elongated mesentery to prevent a re-twisting of the part.

Before leaving the subject of the treatment of acute intestinal obstruction, I would remind the operator that he should always carefully examine all parts of the abdominal parietes for external herniæ, especially those regions where they are most likely to be found. I have known the abdomen opened only to find that a loop of small intestine was strangulated in the femoral canal; in other words, that the patient had a strangulated femoral hernia which could have been quite easily and properly dealt with by the usual operation of herniotomy.

Ruptured ectopic pregnancy, although capable of producing an acute abdominal crisis, does not necessarily

involve operative treatment. There is no doubt that many of these cases would recover without opening the abdomen. If the hæmorrhage ceased, the extravasated blood would eventually become absorbed. We cannot, however, forecast the course which any particular case will take ; and, if the circumstances are such that operation can be undertaken with all proper precautions, then the right line to adopt is to open the abdomen rapidly, remove or scoop out with the hand all the extravasated blood, and search for and secure the bleeding vessels, or better, tie off and excise the Fallopian tube should the pregnancy be, as it most frequently is, of tubal origin. No drainage is required ; and the abdomen may be completely closed. If the loss of blood has been excessive, and the patient's condition suggestive of collapse, transfusion should be commenced before, and carried on during, the operation. These patients usually make an uninterrupted recovery.

Acute pancreatitis. It is now generally accepted that when we find that disease of the pancreas has been the cause of the crisis, the best treatment to adopt is to drain the organ. This applies to whatever condition we may discover ; whether it be in the early acute inflammatory stage, in the hæmorrhagic, in the suppurative, or in the necrotic. The best approach to the viscus is through the gastro-hepatic omentum. It can be reached by raising the great omentum with the transverse colon and tearing through the mesocolon ; but this is not such a convenient and direct route as that above the stomach. When the organ is reached, its structure should be incised or teased asunder with a blunt-pointed instrument, a tube conducted into the opened-up tissue, and iodoform gauze packing placed around to guard the surrounding parts, as well as to assist in conducting away the inflammatory exudates. If the patient's condition will admit, a careful examination should be made of the gall-bladder and ducts, as pancreatic inflammation is not infrequently the result of primary mischief in these parts. If there be pus in the gall-bladder a cholecystostomy should be performed.

When we consider the treatment of some of the rarer conditions which we may encounter, such, for instance, as a ruptured acute abscess into the general peritoneal cavity, it becomes a question of dealing first with the

removal of the pus, and, second, with the part from which the pus comes. Thus, a purulent appendix, a pyosalpinx, a suppurating ovarian cyst or uterine fibroid, would have to be removed. In all cases of this class it is essential to effect free and efficient drainage. The treatment of pneumococcic peritonitis will be dealt with in a later chapter when the subject of acute general or diffuse peritonitis is discussed.

Before leaving the subject of acute abdominal crises, I wish to add a few remarks upon the treatment of cases of acute intestinal obstruction that have exceeded the time limit which I have set for the particular class with which this chapter is strictly intended to deal; for, at present, I think it more frequently happens than not, that the surgeon is called to treat these cases rather some time after than at the time of the acutest phases of the crisis.

When obstruction has lasted for over twenty-four hours, the distended condition of the intestines introduces another factor into the means which must be employed before we can properly treat the case.

In the first place, so-called fæcal vomiting may have commenced; and if such a symptom is present, the stomach must be thoroughly washed out before the anæsthetic is administered. The rapid pulse and weak heart's action are often considered indications for the giving of strychnine. This drug is now, I believe, considered more harmful than beneficial in these particular cases; for, while in health it may have a stimulating effect upon the vasomotor centres, in conditions where these centres are depressed stimulation by strychnine seems still further to exhaust them, and so increases the inhibitive effects.

The condition of the bowel will next demand attention. It may be so distended that no approach to the deeper parts can be made until the distension is relieved. For this purpose, therefore, the intestine should be opened by an incision carried in the long axis of the gut, and opposite to the attachment of the mesentery. The bowel may have reached that stage of paralytic distension when no contraction takes place; and if we are to rid it of its toxic contents we must "milk" out the offensive fluid material of which it usually consists; and more than one opening may be necessary in order to do so. It must,

however, always be considered a very fatal indication when the distended bowel is of a livid hue, and its parietes almost like damp chamois leather. Our only hope largely rests upon the extent to which we are able to free the bowel of its churned-up, poisonous contents. It has been advised by some to flush the bowel with warm water through two or more openings made for the purpose. Before closing the bowel opening, I have in some cases, and with success, introduced through it an ounce of sulphate of magnesia dissolved in a few ounces of warm water. By this means it is possible to obtain an earlier evacuation of the bowels, than if we attempted to administer the drug by way of the stomach.

Fæcal vomiting, while a most serious symptom, must not be regarded as necessarily a fatal one. A good result, as I have personally experienced, may follow upon the successful relief of the obstruction, and the carrying out of such additional precautions as indicated above.

To obtain action of the paralysed bowel, eserine salicylate, in doses of one-hundredth of a grain and given about six times, is said to be useful. Its action is stated to be directly upon the intestinal muscular tissue, and not on the exhausted intestinal nerve plexuses.

CHAPTER XVI

CHRONIC INTESTINAL OBSTRUCTION

THE cases I include under the term of Chronic Intestinal Obstruction are those where there is mechanical impediment to the onward progress of the intestinal contents. Thus, cases of constipation, arising from causes in which the normal calibre of the bowel is in no way diminished, are not discussed. There is quite a sufficiently clear line of demarcation between the two classes of cases to render them capable of distinct and separate consideration.

When confronted with a case of the kind under discussion, the symptoms presented will, in the first place, be largely determined by the degree of obstruction which

exists. Thus, in the earlier stages the patient will state that, for reasons he could in no way explain, he had found it increasingly necessary to take aperients; while patients in the more advanced stages of the disease will complain of colicky abdominal pains which are generally relieved by the passage of fæces, or, more frequently, simply by the ejection of flatus. But between the early and advanced stages we have very variable manifestations, nevertheless all of such a character as to suggest mechanical obstruction.

Now, before entering more fully into the subject of symptoms and their differentiation in respect to the particular lesions producing them, it is necessary to have a knowledge of these lesions, what they are, and how they produce obstruction.

Briefly enumerated, more or less in order of frequency, they are: carcinomatous stricture; tuberculous stricture; simple adhesions; kinks; chronic intussusception; and pressure from external agents. There are a few rarer causes, such as idiopathic dilatation of the colon, incarcerated internal herniæ, &c.

With these commoner causes running through our mind, we shall be first led to direct our attention to the age of the patient and the history given of the complaint. With an elderly patient we shall naturally think of carcinoma; with a middle-aged patient, of adhesions and kinks; with adolescents or young adults, of tuberculous stricture or chronic intussusception. The line, of course, is not a hard and fast one; it is only probable that, at these respective periods of life, the affections named are present.

If we consider, first of all, *carcinoma of the intestine*, the most typical lesion productive of obstruction is a growth which invades and encircles the bowel-wall. In by far the large proportion of cases it is some portion of the colon that is involved; and more frequently the lower than the upper segments. As a rule, emaciation, loss of appetite and of bodily vigour have been slowly advancing symptoms. Pain, which is usually of an intermittent and colicky character, occupies the lower part of the abdomen; it is sometimes preceded by abdominal distension, and is relieved when this, for obvious reasons, subsides. Patients will not infrequently remark

that, at the time of the pain, they are conscious of a "working" of the bowel up to a certain spot, and that this "working" is associated with a good deal of gaseous rumbling. If the abdomen is seen when the patient suffers pain, peristaltic waves of the dilated and hypertrophied intestinal parietes may be visible. At the periods of pain, also, the patient may feel nauseated; and in instances of advanced obstruction, vomiting may take place. The sense of nausea often causes the patient to attribute the feeling to a bilious attack, and that the symptoms are the result of some gastric disturbance. So positive is the patient, sometimes, in indicating this as the cause of the trouble, that he may mislead his doctor into a similar belief.

With regard to the motions, the presence of blood or mucus is mostly determined by the situation of the stricture, that is to say, the presence is more frequent the lower the seat of the growth in the colon. But their presence, at all, is determined chiefly by the nature of the growth itself and the amount of active destructive ulceration which exists. The quantity of mucus is also affected by the extent of catarrhal inflammation of the mucous membrane above the obstruction, itself caused by the irritation of the dammed-back intestinal contents.

Palpation of the abdomen may or may not reveal the presence of the tumour. Often the most marked obstruction is the result of a ring-like stricture which gives, when exposed, the external appearance of a string tightly tied around the bowel. There may be so little actual tumour formation that its detection will be impossible. And further, the stricture when it involves the hepatic flexure, the splenic flexure, and the iliac or pelvic colon, is so deeply placed that it cannot be approached by the examining fingers. Often a scybalous mass is taken for a tumour; but if pressure upon it cause indentation its true nature may be surmised; and the fact that it is felt one day and not another is another indication of its probable character. An actual tumour often presents features of apparent variation due to the fact that an accumulation of *fæces*, now and again, may distend the bowel immediately in front of the obstruction, and so give an incorrect impression of its real size. Strictures low down

in the pelvic colon may be detected by rectal examination ; and assistance is sometimes afforded by ascertaining how much fluid can be injected into the colon. The object of this is principally to locate the seat of the obstruction. It is, however, of doubtful value, as the fluid may quite readily make its way through the constriction, and so mislead both as to its presence and its position. Some useful information has recently been obtained by the employment of bismuth meals and the X-rays ; but this method of locating the seat of obstruction will be more fully considered in dealing with adhesions and kinks.

If we have reason to suspect that the case before us is one of chronic obstruction, the result of a *tuberculous stricture of the intestine*, our suspicions will be based on some such considerations as the following. We may obtain a history of antecedent diarrhœa, continuous or intermittent in character, and very intractable to treatment. In some instances this bowel condition dates back to early childhood ; and is so clear in its symptoms that little doubt is entertained of tuberculous ulceration and catarrh being the cause. A striking and almost pathognomonic character of the stools in these cases of chronic diarrhœa is their extreme offensiveness ; why this should be so it is not easy to understand, except on the ground that the secretion from the inflamed and ulcerated bowel causes various saprophitic changes which liberate gases of decomposition.

In some cases, the first and only symptoms are those of occasional attacks of griping pain. In all other respects, the patient may appear in good health with a good appetite, but occasionally in need of an aperient to obtain an evacuation. As time, however, proceeds, more typical symptoms develop. We then find the attacks of abdominal pain more frequent, the bowels more irregular, sometimes constipated, sometimes loose. The appetite begins to fail, emaciation ensues, and the patient assumes a general aspect of enfeeblement. The fancy for one kind of food and the distaste for another may convey the impression that the patient's digestion is at fault. But, as in the case of carcinomatous stricture of the colon, the stomach frequently manifests prominent dis-

turbances when the bowel alone is the seat of an organic lesion.

As regards the seat of pain, with the exception sometimes of disease in the right iliac region, it is generally referred to the abdomen as a whole. One reason for this usual want of localisation is the frequency with which the lower parts of the small intestine are involved in multiple strictures. Sometimes, indeed, the strictures extend high up the jejunum.

The first seat of obstruction, reckoned from above downwards, is the point from which extends upwards the dilated and hypertrophied bowel. This is really where the pain is produced, and not at the actual seat of the stricture. It is the continuous effort exercised by the muscle parietes of the bowel to overcome the obstruction that causes the griping and aching pains. When the bowel has succeeded in forcing its contents, be it *fæces* or flatus, through the constricted channel, relief follows.

When, as frequently happens, the disease is located in the cæcum and involves the ilio-cæcal valve so that definite obstruction exists, the pain is manifested mostly in the right iliac region. It is these cases that are so often mistaken for disease of the vermiform appendix; and, in some instances, it is by no means easy to differentiate the symptoms and make a diagnosis before opening the abdomen.

When the attack of pain comes on, the patient will sometimes plainly indicate that relief does not ensue until the pain has worked into the right iliac fossa; then a swelling takes place, gurgling is heard, and, as the swelling subsides, the pain passes away.

When we come to palpate the abdomen, it is rarely that the indurated stricture of the ileum can be detected; but a diseased cæcum may give very marked evidences of resistance and deep swelling. Whether pressure on the part produces pain will depend upon the existence, and the amount, of mixed infection implicating the viscus. The more marked such involvement the more tender will be the region.

In cases that have progressed very slowly, the dilatation and hypertrophy of the bowel above the obstruction may be so great as to produce very marked peristalsis,

Independently, however, of peristalsis, the distended coils of small intestine may present a "ladder-like" appearance beneath the thinned abdominal parietes. It is, sometimes, quite extraordinary to what dimensions the dilated small bowel may reach; it has even been mistaken, on opening the peritoneal cavity, for the stomach. Succussion, also, is quite a marked feature in some cases of extreme dilatation. I have known this, too, to so closely resemble the splashing obtained in the case of a dilated stomach that it has been taken for it. The error is, of course, easily corrected by removing the contents of the stomach, which will necessarily have no effect on the dilated small intestine.

Few more puzzling cases of chronic intestinal obstruction come before us than those which owe their origin to *simple fibrous adhesions*. It is not often we correctly diagnose our case before the abdomen is opened, unless there is something in the past history of the case which suggests reasons for arousing our suspicions. Inasmuch as adhesions are the result of previous inflammation, the fact that we obtain a record of what we consider must have been peritonitis, local or general, carries us a long way in the direction of forecasting the probable cause of the obstruction.

Among the commonest causes of a localised peritonitis are inflammatory affections of the vermiform appendix in both sexes, and of the pelvic viscera in the female. Other causes probably more distributive in their results are catarrhal affections of the intestines, particularly of the colon. Tuberculous lesions may be productive of either a local or a general peritonitis, so that the resulting adhesions may be quite limited or very extensive; indeed, the more widely distributed adhesions that we meet with are usually the result of a general tuberculous peritonitis.

We must also remember that the previous performance of an abdominal operation may be the source of adhesions that could have obstructive effects. So that when we observe the presence of a cicatrix on the abdominal parietes we must bear in mind the possibility of fibrous attachments between it and other parts in the abdominal cavity, such as the mesentery, the mesocolon, and the bowel.

But for the history which we may be able to elicit, there

is little else in the clinical features of any particular case to help us in making a diagnosis. Indeed, it is rather by a process of exclusion that we are led to suspect the true nature of the case.

Pain is, as a rule, the most constant symptom. It is most irregular in its appearance, often troubling the patient at night, as much as, if not more than, during the day.

The slighter degrees of obstruction are naturally much more puzzling to diagnose than the more advanced forms ; for, as can well be understood, when the calibre of the intestinal canal is considerably diminished the results approach much more in their manifestations those we are familiar with in the case of advanced carcinomatous or tuberculous stricture.

The prolonged retention of the fæces in front of an obstruction is liable sometimes to produce certain constitutional symptoms. These have been very fully drawn attention to by Arbuthnot Lane (*British Medical Journal*, April 22, 1911), and may be thus briefly enumerated : "general depression and want of energy, which may be so extreme as to make life intolerable ; poor appetite with attacks of nausea or vomiting ; a bad taste in the mouth ; breath of an unpleasant odour ; headache, backache, muscular pains and aching in the joints ; cold hands and feet and other signs of poor circulation. The skin is stained, sometimes to a deep brown colour ; it feels unhealthy as though wanting in elasticity ; the sweat has a disagreeable odour. The breasts show changes such as are usually described as chronic mastitis ; in more advanced cases cystic degeneration takes place, and the breasts are then in a condition in which a transition to cancer is very liable to occur. Similar changes are produced in other glands, and at operations on these patients chronic pancreatitis is found to exist ; in many cases cholecystitis is present also, and gall-stones are very often found." It is right to observe here that the symptoms thus narrated are given by Mr. Lane in connection with the subject to which he has directed so much attention, that of chronic intestinal stasis, and that this condition is not necessarily the result of the forms of organic obstruction at present under discussion.

As bearing on the subject of diagnosis, not a little assistance may be looked for in the administration of a bismuth meal and the use of the X-rays. Radiographers have done much to show us how we may utilise such means to detect the seat of obstruction in the bowel. An excellent series of photographs will be found in the *Lancet* (December 30, 1911), taken by Dr. A. C. Jordan, illustrating

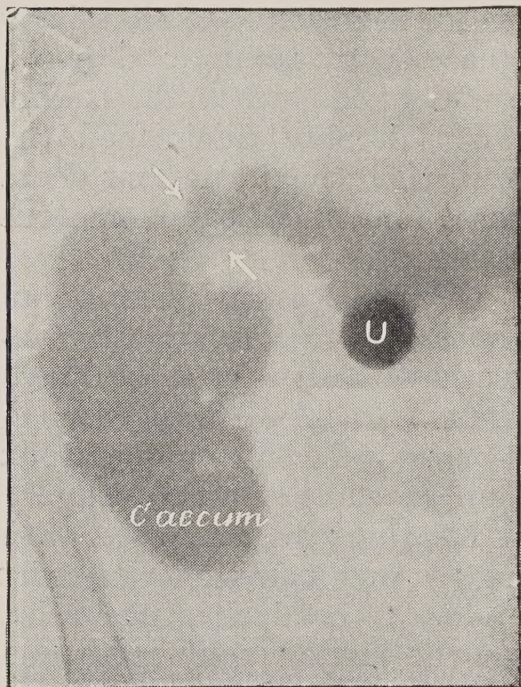


FIG. 28. A skiagram taken forty-seven hours after a bismuth meal, to show where fibrous bands obstructed the transverse colon just beyond the hepatic flexure. U, umbilicus. (A. C. Jordan.)

the position and appearance of the large bowel under various conditions. One which, with his kind permission, I have reproduced here (see Fig. 28), indicates the appearance which the bowel presents when the colon is obstructed by adhesions at the hepatic flexure. To put this method of investigation into practice, we must administer a bismuth meal. This consists of a couple of ounces of bismuth oxychloride thoroughly mixed in a bowl of bread and milk. It may be given best as the patient's breakfast. Under normal circumstances, we may expect,

according to Herz, to find the meal at the following situations at certain given times after its consumption: "The cæcum is normally reached in a little over four hours after the bismuth meal, the hepatic flexure two hours later, the splenic flexure three hours after the hepatic flexure, and the beginning of the pelvic colon twelve hours after the commencement of the meal." (*British Medical Journal*, 1912, vol. i, p. 227). In cases of obstruction, however, the value of the investigation is not so much in the time taken for the meal to reach

any particular part of the canal, as in the shadow which is given of a dilated segment immediately proximal to a narrowed one.

Should obstruction be due to a *kink* the symptoms resulting therefrom will be indistinguishable from those just narrated in the case of adhesions; indeed, one of the results of these latter may be the production of a kink.

It only remains, therefore, to remark that, as distinguished from obstruction due to adhesions, a kink may be the result of other causes. It is due particularly to Mr. Arbuthnot Lane that we have come to recognise more fully that the bowel may be obstructed from abnormal natural causes. By this is meant, that there are certain parts of the intestinal canal where natural bends may become so increased or exaggerated that actual obstruction may result. Thus, in the condition known as "visceroptosis," parts of the intestine, losing their natural suspension, may produce so great a strain on certain fixed portions that a kink results. This is more frequently seen at such parts as the hepatic and splenic flexures of the colon, and close to the junction of the ileum with the cæcum—this last acute bend being known as "Lane's iliac kink." Another kink is that at the duodeno-jejunal bend; but that hardly concerns the subject with which we are at present dealing.

The symptoms, more particularly associated with these obstructive kinks, are usually of long duration, and result in constitutional and local conditions such as have already been described under the head of "intestinal stasis." It need hardly be further pointed out that special diagnostic value is attached to the employment of bismuth meals and the X-rays, a method of investigation fully described above in dealing with obstruction from adhesions. It is specially in connection with obstructive kinks that Jordan's paper, already referred to, deals; and which is so well illustrated with skiagrams depicting the different kinks that may be met with in various parts of the intestinal canal.

Chronic obstruction the result of *chronic intussusception* is comparatively rarely met with. What is most likely to awaken our suspicion, in respect to such a lesion being the cause of the obstruction, is the detection, by abdominal

palpation, of a marked swelling, possibly sausage-shaped in configuration.

This particular type of intussusception is usually met with in the adult, where the general calibre of the bowel being larger than in early life, the invagination does not cause complete obstruction, for there still remains a central channel through which gases and liquid fæces can pass.

It is almost always the result of a tumour; and more particularly so when the growth is shaped like a polypus. For the projection of such an object into the canal tends to excite a propulsive action or an effort to rid the gut of its unnatural contents. As the tumour is fixed, its passage onwards drags with it that part of the bowel to which it is attached. It sometimes happens that a carcinomatous stricture forms the apex of the intussusceptum; and as these strictures are situated almost exclusively in the large bowel, it is the colon that affords us most illustrations of the disease.

The history given in these cases helps us but little in differentiating them from other causes of chronic obstruction. The obstructive symptoms of constipation, intermittent colicky pains, flatulence, nausea, and sometimes vomiting, all increase in frequency and severity as the intussusceptum advances, for the simple reason that the impediment to the passage of anything is proportionately increased. Except in the presence of a definite sausage-shaped tumour it is doubtful whether a certain diagnosis is possible, or is ever made before the abdomen is opened.

When chronic obstruction is due to *pressure upon the bowel* from external causes, these latter are usually of such physical dimensions that their presence, if not actually obvious, is easy of detection by other means.

Pressure is most effectively exercised by growths within the pelvic cavity; the rigidity of the walls of this part of the abdomen, together with the comparative fixity of the pelvic colon, allows of little chance of its escaping obstructive pressure; so that tumours of the parietes or of the pelvic viscera, until they emerge into the general peritoneal cavity above, are liable to jamb the bowel against the non-resisting walls of the cavity.

It is rarely that large tumours in the cavity of the

abdomen above the pelvis exercise sufficient pressure to cause obstruction. The freedom with which the small intestine, through its long mesentery, is able to slip about removes it from liability of compression; and such flattening as it may be subjected to is hardly likely to obstruct the passage of its contents, which are practically fluid. The colon, however, possesses neither of these attributes, for it is more or less fixed, and its contents are more or less solid, so that obstruction can easily be caused by tumour or tense swelling. A remarkable illustration of the obstructive effects of a tense swelling came under my observation some years ago. I have already alluded to the case under the heading of Carcinoma of the Stomach (*see* p. 165). The obstruction at the pylorus led to such an enormous distension of the stomach that it contained eleven pints of fluid; and this pressed with such effectiveness upon the colon, that the patient was admitted to the infirmary as a case of chronic intestinal obstruction.

Before ovarian cysts and uterine fibroids were operated upon at the early stages they are at present, it was no infrequent sequel to their presence to have the patients suffer from chronic obstruction.

Treatment. In discussing the subject of treatment, the initial step we take will, in the first place, be determined by our knowledge of the cause of the obstruction beforehand.

If we are clear, for obvious physical reasons, of the situation and character of the lesion, our abdominal incision will be so made as to enable us to execute what we desire. Apart, however, from such definite knowledge we may have sufficient signs to guide us in believing the obstruction to be in some part of the large bowel; and that, if we are to consider nothing more than the relief of the symptoms, an opening must be made in the colon. If, however, our knowledge extends no further than the fact that the patient is suffering from chronic obstruction, the cause of which we are quite ignorant, our incision should be made through the middle line of the abdominal parietes below the umbilicus.

Although such a strong advocate of transverse incisions, as I have indicated in an earlier chapter (*see* chap. iii),

circumstances may render it advisable to adopt the vertical. These circumstances exist in the case of chronic obstruction, for patients, who already are to a certain extent suffering from fæcal toxæmia, ought not to be subjected to prolonged operations which, through the influence of the anæsthetic, are liable to produce still more depressing effects upon the heart and the excretory organs. I need not enter here into the reasons, so fully given elsewhere, of the greater speed involved in opening and closing the abdomen through a median incision as compared with a transverse. The object of the incision is, in the first place, to discover, if we can, where the obstruction exists, and what is its nature. Such a discovery may indicate that the exploratory opening should be closed, and the abdomen opened at a more convenient place.

It should still further be pointed out that our action will be considerably affected by the constitutional state of our patient. If the obstruction approaches the acute form, and there are evident symptoms of fæcal toxæmia, nothing else should be thought of at the time but simple and rapid relief to the obstruction by opening the distended bowel proximal to the lesion.

With these various contingencies to consider it will be advisable to take each separately, and discuss the practical procedures best to adopt under the conditions presented.

But let me first prepare the operator for one possible unexpected contingency that may happen in any case where the abdomen is greatly distended, and the intra-intestinal tension at a maximum. It is under these circumstances that immediately he opens the abdomen, distended coils of intestine may force their way out and render any further operating progress impossible until the bowel has been incised and its contents let out. When this has been done we may close the opening and proceed with what we wish to do. So great, sometimes, is this gaseous distension of the bowel, that immediately the restraining influences of the abdominal parietes are removed, further expansion is permitted and the bowel bursts, discharging its contents, as I have seen, for several feet from the operating table.

First, then, I will assume that it is considered advisable to do nothing more, in the meantime, than make an

opening into the distended bowel, and so relieve the obstruction. The nature of this opening will depend upon whether we wish it to be permanent or only temporary; in the one case we make an artificial anus; in the other, we perform enterostomy or colostomy.

If the uncertainty is such that it seems likely that the small intestine will have to be opened, the best place to approach the bowel will be in the right iliac region; for this reason, that we are more likely to open the ileum and not the jejunum; and to tap the bowel where there is more likely to be true intestinal contents than chyme from the stomach.

With the small intestine we never wish to perform more than an enterostomy. The distended loop of the intestine should be sufficiently drawn out of the abdomen to enable it to be opened, and a Paul's glass tube inserted. This process must be carried out with the greatest possible care, for the fluid contents of the tensely distended gut so readily escape, that, without proper protection of the wound and the peritoneal cavity, this latter can be easily infected. When the tube is properly secured in the bowel by a purse-string suture the latter may be returned; and the marginal ring of bowel tissue around the tube is fixed by a few stitches to the edges of the wound to prevent a complete return of the opened loop. To attempt simply to secure a part of the wall of the *distended* bowel to the margins of the abdominal wound is to run grave risk of soiling the peritoneum from the escape of fæcal contents through the needle punctures of the intestinal wall. The tension within the distended bowel is often so great, and the parietes of the small gut frequently so thin, that leakage is very apt to occur when the needle and suture traverse, as they almost certainly will, the whole thickness of the visceral parietes. It is therefore, for this reason, that it is advisable to withdraw the loop from the abdomen, and open it to relieve the tension, before attempting to suture the visceral to the abdominal parietes.

If our intention is to open the colon, and we are in doubt as to the situation of the obstruction in that part of the canal, we should first open the abdomen by a "gridiron" incision in the left iliac region. Should we find collapsed intestine here, we must close this incision and proceed in a

similar manner to open in the right iliac region. The great objection to opening the cæcum or the ascending colon, when we could with equal success have relieved the obstruction by opening the iliac colon, is, that the almost fluid character of the fæces on the right side renders excoriation of the skin a source of great inconvenience and trouble to the patient ; indeed, the painful burning sensations which often follow the erosion of the epidermis, not to speak of the positive pain evoked by the contact of the dressings which act as mechanical irritants, make these patients' lives perfectly miserable. We should, therefore, always make sure that it is only unavoidable necessity that drives us to open the commencement of the colon instead of practically its terminal segment.

Acting in the belief that the nature of the obstruction is such that we may wish only to relieve temporarily the distended bowel, we may perform a colostomy.

We have a choice of several methods both as regards the way to open the abdomen and the means of securing the bowel. I shall, however, not enter into the details of these various procedures, but merely indicate that particular method which I am accustomed to practise.

Whether in the right or the left iliac region, the peritoneal cavity is approached by the well-known "gridiron" incision. The colon is then sought for ; and when identified by its longitudinal muscle bands, it is accurately stitched to the edges of the parietal wound. If the symptoms are not such as to require that the obstruction should at once be relieved, an incision may be delayed for twenty-four hours or so, to allow of the visceral and parietal peritoneal surfaces becoming glued together, and thus more effectually prevent any possible infection of the peritoneal cavity around the freshly sutured line of union.

If we decide to make an artificial anus, that is to say, to divert the whole contents of the bowel through the abdominal opening, and not merely a portion, as is done in the case of colostomy, we again have several methods by which we may secure such a result. I shall, however, here also only describe such as personal experience has taught me to best serve the purpose.

The "gridiron" incision is similarly employed. The distended colon is sought for and brought out of the

abdomen sufficiently far to admit of its mesentery being transfixed by a glass rod. Without further fixation by stitches the external wound is sutured to the required extent. If it is considered wise to at once afford relief, the bowel is opened and a bent glass tube inserted; if no such immediate opening is considered necessary, this part of the operation can be delayed, the delay ensuring, as in the case of colostomy, proper sealing of the applied visceral and parietal surfaces of the peritoneum, and thereby the avoidance of any infection of the peritoneal cavity. In about a week's time the extruded loop of intestine may be removed. This may be done by excision or by cautery; but whichever method is adopted, there is very likely to be a good deal of hæmorrhage from the vessels in the mesocolon. The result of this method is that we have two orifices left; the upper, the artificial anus; the lower, that which leads to the diseased portion of the intestine. This latter opening may sometimes prove of some service in permitting irrigation of the malignant ulcer—if such exist—by means of injections given from below or above.

Another method which I have practised, and one I think worthy of commendation, is one to entertain when we are considering the possibility of having, at a future time, to remove the whole colon and rectum. It is executed thus: The loop of the distended bowel is well withdrawn, the mesocolon is tied off, and divided so as to free the bowel. It is then cut through, the distal end is closed and replaced into the abdomen; the proximal has tied into it a glass tube and is stitched carefully to the edges of the parietal wound which itself is sutured to the required extent. Thus, it will be seen that the part to be subsequently removed is free from any connection with the artificial anus; and being a closed canal there is no fear of any soiling of the general peritoneal cavity. In adopting this method, I must emphasise the importance of one detail in its execution; and I do so on the basis of a fatal result which followed in one of my cases. I give the facts of the case because they will more fully impress upon the operator the significance of the precautions it is advisable to take.

The patient, a woman aged forty-one years, was admitted to the hospital with a history of seven days chronic intestinal

obstruction. She had passed flatus but no fæces. Her abdomen was greatly distended, and marked peristalsis outlined the dilated coils of intestine. A cancerous stricture could be felt high up in the rectum, fairly movable, and suggestive of the possibility of future removal. She had not vomited, and did not look particularly ill.

I opened the abdomen by a gridiron incision in the left iliac fossa ; and without much difficulty the distended iliac colon was identified, and withdrawn from the abdomen. The mesocolon was short, and did not allow of very free exventionation of the loop. It was transfixed by a pair of bowel-clamp forceps which helped to secure the proximal end after division of the gut. A rather striking and instructive incident happened at this stage after I had cut through the intestine. Suddenly, quite a forcible extrusion of gas and fæces took place from the distal orifice ; indeed, so marked was this that it led my assistant to raise the question whether it was the proximal end. However, I inserted a steel bougie, and with an assistant's finger in the rectum, I was able to make certain of the correct disposition of the parts, and that this orifice was that of the distal segment. This accidental occurrence proved how powerful was the retro-peristaltic action when there existed an almost impermeable block preventing a natural escape of the intestinal contents per anum. I then stitched up the distal aperture by a double row of Lembert's—an internal continuous and an external interrupted ; tied the vessels in the mesocolon ; and returned the bowel stump into the abdomen. The proximal end of the bowel, which would form the future anus, was united to the edges of the wound ; and the latter closed to the required extent. The patient recovered from the anæsthetic, and the bowels moved freely. However, about six hours after, her pulse became very rapid and the heart's action weak. She died an hour or so later from what was described as cardiac failure. Nothing had happened to suggest any acute abdominal crisis. Fortunately we obtained a postmortem.

Immediately the general peritoneal cavity was opened, a quantity of offensive gas escaped, and the whole abdomen was found full of a thin, brownish fluid of a powerfully fæculent character. The distal, occluded segment of the colon was tensely dilated ; and on exercising a little

extra pressure a leakage was discovered at the mesenteric end of the stump. It then became perfectly clear that a retro-peristaltic wave, such as was observed prior to closing the bowel, had caused so great an amount of intra-intestinal tension, that this particular place, usually the weakest point in the line of union of a sutured bowel orifice, had failed to withstand the pressure, and so a leakage resulted.

The accident is not without its lessons ; and they are these, that when the obstruction is such as to indicate great intra-intestinal tension, we must hesitate before deciding to perform such a method as that under discussion, otherwise we may, by completely closing the distal orifice, produce a practically occluded segment. If, however, we forcibly dilate the anus, and we are able to pass the finger through the stricture, or better still, conduct a drainage tube past it, we may have very little fear that any tension is likely to be forcible enough to cause a leakage through a carefully sutured orifice.

This, then, is the detail to which I think it right to direct special attention when it is decided to adopt a measure which, in all other respects, fulfils so well the double object of making an artificial anus and facilitating the future removal of the diseased distal segment.

Paul, in his "Address on Surgery," at the Annual Meeting of the British Medical Association, on the subject of his "Personal Experiences in the Surgery of the Large Bowel," advocates colostomy ("colotomy") in the right lumbar region for obstruction distal to the hepatic flexure (*British Medical Journal*, vol. ii, 1912, p. 172). The chief object for the selection of this situation is that, if removal of the disease is to be subsequently attempted, the fæcal fistula is well away from the seat of operation and unlikely, therefore, to contaminate the wound. Such a distant relationship is certainly an advantage as compared with the proximity of a fistula in either the right or left iliac region. But it fails, I think, in affording those other facilities which are gained by adopting the method I have just described, when that can be properly carried out. However, the methods are not entirely comparable ; because Paul merely performs a colostomy, while my method involves the formation of a permanent artificial anus. When re-establishment of the continuity of the

canal subsequently proves possible, as is likely to be the case when the disease is not too extensive and only implicates some part of the colon well above the rectum proper, Paul's method has distinct advantages ; for as soon as the fæces can resume their normal course, the lumbar anus will close. On the other hand, if no such re-establishment of continuity is possible, then the formation of an artificial anus, in the way above described, with the occlusion and freeing of the distal segment, renders complete extirpation a much simpler and safer procedure.

While, as I have stated above, I have no intention of discussing other methods, I would like to add a few remarks by way of criticism on the many proposals that have been made to try and obtain a sort of sphincteric control. I have myself tried various kinds of parietal incisions with this object in view ; as, for instance, splitting the muscles in the direction of their fibres ; passing the bowel obliquely through the parietes or under a collar of skin and subcutaneous tissue, &c., but they one and all failed ; and for this very good reason, that the discharge from the artificial anus does not call forth a reflex, or a power of voluntary contraction of the orifice in any sense comparable to the natural external sphincter. Furthermore, while we may effect a certain amount of constriction at the orifice, this is capable of having a deleterious effect upon that portion of the colon proximal to the outlet. Being totally unlike the rectum, which has strong muscle parietes, and is contained within the rigid cavity of the pelvis so that it receives considerable outside support, the colon has comparatively thin walls, and is free to expand, practically without limit, in the, so to speak, lax abdominal cavity. The result is, therefore, that the bowel gradually dilates, and tends to form a big receptacle which may become loaded with fæces, and so a source of much inconvenience and even actual trouble to the patient.

I cannot and must not refrain, however, from giving vent to the opinion of so good an authority as William J. Mayo on what he considers it possible to obtain in the way of functional control in an artificially-made fæcal fistula. In writing upon the subject of "Cancer of the Rectum" he states : "Colostomy through the left rectus, as advocated by Lilienthal, gives good functional results,

and, as contrasted with a preternatural anus in any other situation, is to be preferred. A colostomy in the rectus muscle can be controlled by a simple abdominal binder—the weight of the abdomen in the bandage making the gentle pressure that is necessary for closure. The rectus muscle is as controllable as the biceps, and temporary voluntary control is often obtained, even against gas and fluids. Iliac colostomy, on the contrary, is placed in a situation where pressure must be brought by a pad or some artificial means; the control may be efficient, but generally does not bear comparison with that obtained when the opening is made through the rectus muscle” (*Annals of Surgery*, Part 236, 1912, p. 242).

The chief objection to this situation is just that which makes the right lumbar seat advocated by Paul so advantageous; that is to say, the fæcal fistula through the rectus practically places this septic orifice in the line of any incision which it may be deemed necessary to make in order to attempt subsequent excision of the disease.

It is, of course, a much easier matter to obtain mechanical control in the case of a colostomy than in that of an artificial anus. A vulcanite plug fitted with a broad shield can be easily kept in position by means of a binder, and will, in many instances, succeed in exercising the necessary retention; but with an artificial anus, where the whole bowel contents can only escape by the newly made orifice, nothing can prevent the passage outwards of fæces when peristalsis sets in.

One or other of two rather troublesome sequelæ may take place in the course of time bearing upon the patency of the artificial orifice. It may contract to such an extent as to no longer afford the necessary relief to the original source of obstruction; or the opposite may happen, and the orifice become so large that the mucous membrane, and sometimes the whole bowel, may prolapse through it. When the aperture is reduced to a very small size, which it is very apt to do when only a colostomy has been formed, it may be re-enlarged by the insertion of a sea-tangle tent; as this swells, the opening is dilated. I have found this simple device quite an effective way of dealing with partially occluded orifices.

In the case of prolapsed intestine through an opening

that has gradually enlarged, little can be done except that, after the prolapse has been returned, it may be kept within the abdomen by a properly fitted truss. It must, however, always reproject every time the bowels move. Amputation of the projecting portion may sometimes be done.

This is quite a fitting place to introduce a few remarks of how best to deal with an artificial anus which it is desired to close. Simple as it may seem when superficially considered, it becomes in practice often a very serious and even fatal operation. We must undoubtedly regard the operation, in most instances, as a difficult one, and one to be classed among the major operations of abdominal surgery. I do not allude, it must be understood, to the closure of a colostomy wound; for in the large majority of these cases the removal of the obstruction distal to the fæcal fistula leads to a gradual natural contraction and occlusion of the orifice; and, if any treatment is required, it may be nothing more than to freshen the edges of the wound.

The particular points about an artificial anus—whether made such or has become such after an ordinary colostomy—that makes its closure so difficult and frequently so dangerous are the following. Although to outside appearances there exists only the anus, within the abdomen there is likely to be a considerable area of attachment of the bowel wall to the parietal peritoneum. This tends to render the detachment of the parts difficult; and when separation has been effected, a considerable length of bowel in the neighbourhood of the orifice is devoid of healthy, normal peritoneum.

These conditions hold, with equal if not greater force, in the case of such colostomies where closure cannot be so simply effected as described above, and where we are compelled to deal with the condition in the manner as at present being described.

Most failures in the past have been due to too restricted efforts; anastomoses and occlusions have been attempted in those particular parts of the intestine where the peritoneal surfaces have been destroyed by adhesions. Such applied or sutured parts do not rapidly unite, and the consequence is that, sooner or later, leakage ensues; and

if nothing more than an abscess results with a re-establishment of a fæcal fistula we may consider fairly good fortune has favoured us ; for, only too frequently, this mischief is much more extensive, and, in place of a local lesion, we may have a general septic peritonitis.

These facts have taught us that we must make our field of work much larger. We must—after plugging the orifice and cleansing as well as we can the surrounding skin—make a very free opening into the abdomen, including in our abdominal incision an elliptical portion of the skin which carries with it the artificial orifice. When the abdomen is thus opened and the part so far separated carefully held by an assistant in order to guard against any contamination of the general peritoneal cavity, a part of the gut both above and below is sought for where the peritoneal surfaces are normal. These two parts, above and below, mark the places at which the bowel is to be cut through ; that is to say, the whole of the intervening segment or segments is or are to be removed. There is no likelihood of removing too much ; the danger really lies in not cutting through the bowel where there are absolutely clean peritoneal surfaces, surfaces that, when brought together, rapidly cement and render union perfect and leakage impossible.

As regards the methods for re-establishment of the continuity of the canal, these I leave for later discussion when dealing with bowel excisions for tumour.

If the cause of obstruction be a *carcinomatous stricture of the colon* it is possible that we may have only been able to ascertain that such is the cause at the time when we have made our exploratory incision. If the chronic obstruction has neither been prolonged, nor is severe, we may consider the question of primary excision. It may, however, be said to be safer, in most instances, first to relieve the obstruction and then later to remove the disease.

Excision of a malignant stricture of any part of the colon should be free. So long as the disease is to all intents and purposes limited to the bowel this is possible with the transverse colon, but less so with other parts, such as the hepatic and splenic flexures. However, it is so important that a considerable portion of the bowel on each

side of the disease together with its gland-containing mesentery should be removed, that the part must be freely mobilised. With the ascending, descending, and iliac segment mobilisation is effected by dividing the outer sheath of the mesocolon of the respective parts.

If it should so happen that the disease has extended beyond the bowel and invaded the neighbouring tissues to such an extent that extirpation is impossible, then relief can best be afforded by dividing the bowel proximal to the obstruction, closing the distal end, and implanting the patent orifice into the bowel beyond the obstruction.

There are various ways of re-establishing the continuity of the canal after excision, and after simple division when excision is not possible.

We may, after excision, perform end-to-end union ; close the distal end and plant the other into the side of the distal segment ; close both ends and, after laterally approximating the two segments, make a fresh opening between the two applied parts ; or, lastly, we may invaginate the proximal end through a lateral opening in the wall of the distal segment.

Of these four different methods I much prefer the last when it can be carried out.

The chief objection to the first method, that of end-to-end union, centres in the great disparity which generally exists between the calibre of the canal proximal and distal to the seat of obstruction. The wideness of the one and the narrowness of the other renders accurate coaptation of the two orifices difficult, if not impossible ; and still further, the distension which must necessarily ensue is likely to put such strain on the sutured margins that leakage may happen. Another drawback lies in the management of the mesentery, for this is always a difficult part of the bowel circumference to ensure efficient coaptation.

The second method, the closure of the distal orifice and the implantation of the other into the side of the distal segment, has more to be said in its favour ; for the wall of the distal segment presents a clean, unbroken, peritoneal surface ; and the only one weak spot is at the mesenteric border of the implanted segment. There still remains, however, a line of union where tension

may give rise to leakage ; but this is less likely to happen than in the preceding method, because there need be no disparity in the diameter of the two openings ; for that on the side of the distal segment may be made of any size to suit the requirements of the orifice to be implanted.

In the third method, the closure of both ends and the lateral approximation of the two segments with the formation of a fistula bimucosa, we have a safer means of effecting anastomosis than in either of the two preceding methods. The mesentery or mesocolon adds no complicating factor, for only the free peritoneal surfaces are applied to each other. There still, however, remains a line of union which, under tension, may allow of leakage. But if the suturing has been carried out in the same way as we execute a gastro-jejunostomy there is very little likelihood of such an accident. In reference to this particular method I may point out that I do not think it much signifies which way we apply the two segments together ; that is to say, whether the two occluded orifices are both pointing in the same direction or in opposite directions. If we have sufficient lengths of bowel to manipulate we may select the latter course as more naturally re-establishing the continuity of the canal ; but it almost more frequently happens the other way, that the lengths of bowel available are limited, and we may then find it much easier to pull on the two occluded orifices and stitch the two bowel walls together for the required distance. I have succeeded just as well with one method as with the other, so that the disposition of the parts may determine which plan we may or must adopt.

My preference lies in the fourth method ; one which I have now carried out with success several times. It consists in invaginating the proximal segment into the distal through an opening made in the lateral wall of the latter. I first described the method in a paper published in the *Annals of Surgery* (vol. xlix, p. 690). Its performance since then in several cases confirms me in the belief that it holds out a valuable method of anastomosis for all cases where there is marked disparity between the orifices of the two segments of the canal : where rapidity of completing the operation is desirable ; and where early feeding in advanced stages of emaciation

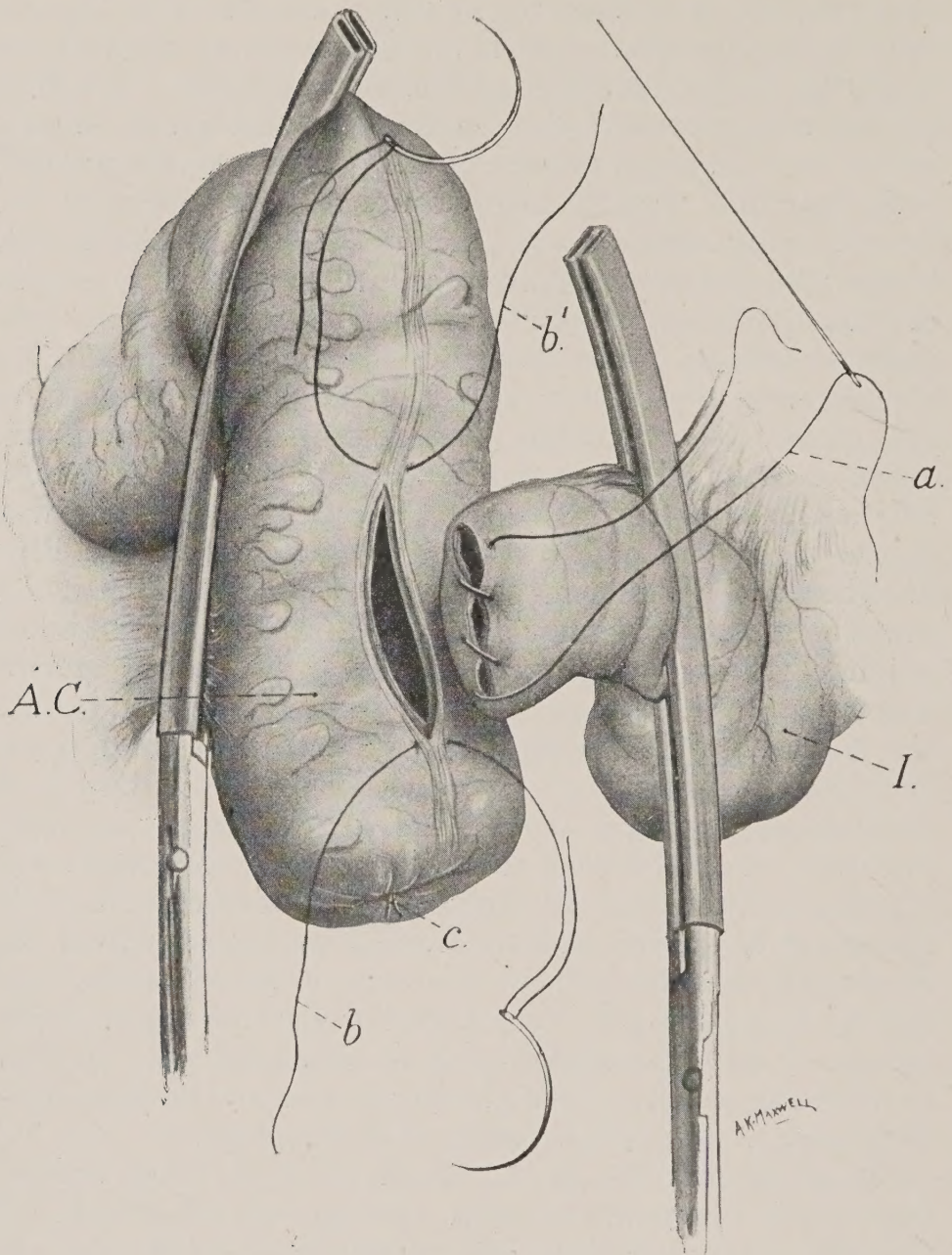


FIG. 29. Intestinal anastomosis by invagination. *A.C.*, Ascending colon; *I.*, ileum; *a*, traction suture for pulling on and invaginating the bowel; *b* and *b'*, the two sutures passed ready for uniting the bowel to the colon after invagination; *c*, purse-string suture for occluding the end of the colon.

is of considerable importance. How these different factors are effected by the operation will be better understood after the details of its execution have been fully described.

A glance at the diagrammatic illustrations will at once make clear the procedure adopted.

Let us suppose the case to be one of excision of the cæcum either for carcinoma or tuberculous disease.

After the removal of the diseased part, the proximal patent end of the ascending colon (*see* Fig. 29, *a*), is stitched up, and withdrawn enough to permit a longitudinal incision of sufficient length to be made through the parietes slightly above the occluded end (*b*). The length of the incision will be determined by the size of the ileum, which, in cases of prolonged obstruction, may be much dilated and hypertrophied. Just beyond each end of the incision two separate chromic gut sutures are passed which take a good grip of the bowel wall; they are, for the time, secured by forceps and left until after the ileum is invaginated.

A large-eyed, long, straight needle threaded with about twelve inches of silkworm gut is carried some three or four times across the orifice of the ileum as if to occlude it (Fig. 29, *a*). The free end of the suture, which was left long, is then passed through the eye of the needle, so that the ileum is now secured as by a sling. The needle is next passed into the colon through the previously made incision, and directed up the intestinal canal for about two inches, where it is made to penetrate the bowel wall (Fig. 30, *d*) from within outwards. By pulling out the needle, and consequently dragging upon the sling suture, the ileum is—with the aid of a little guiding—drawn through the incision and made to pass for a short distance along the canal of the colon. While an assistant keeps tension upon the sling, the operator commences to fix the ileum to the colon. This is done by first threading each chromic gut suture (*b*, *b'*)—already passed above and below the incision in the colon—into a curved bowel needle. One suture is passed as a continuous Lembert round one-half of the circumference, the other round the other half, the ends at each extremity being tied together.

By cutting one end of the silkworm-gut sling suture close to the bowel and pulling on the other the whole stitch is withdrawn and the orifice allowed to open. It only remains, for security's sake, to tie a ligature round

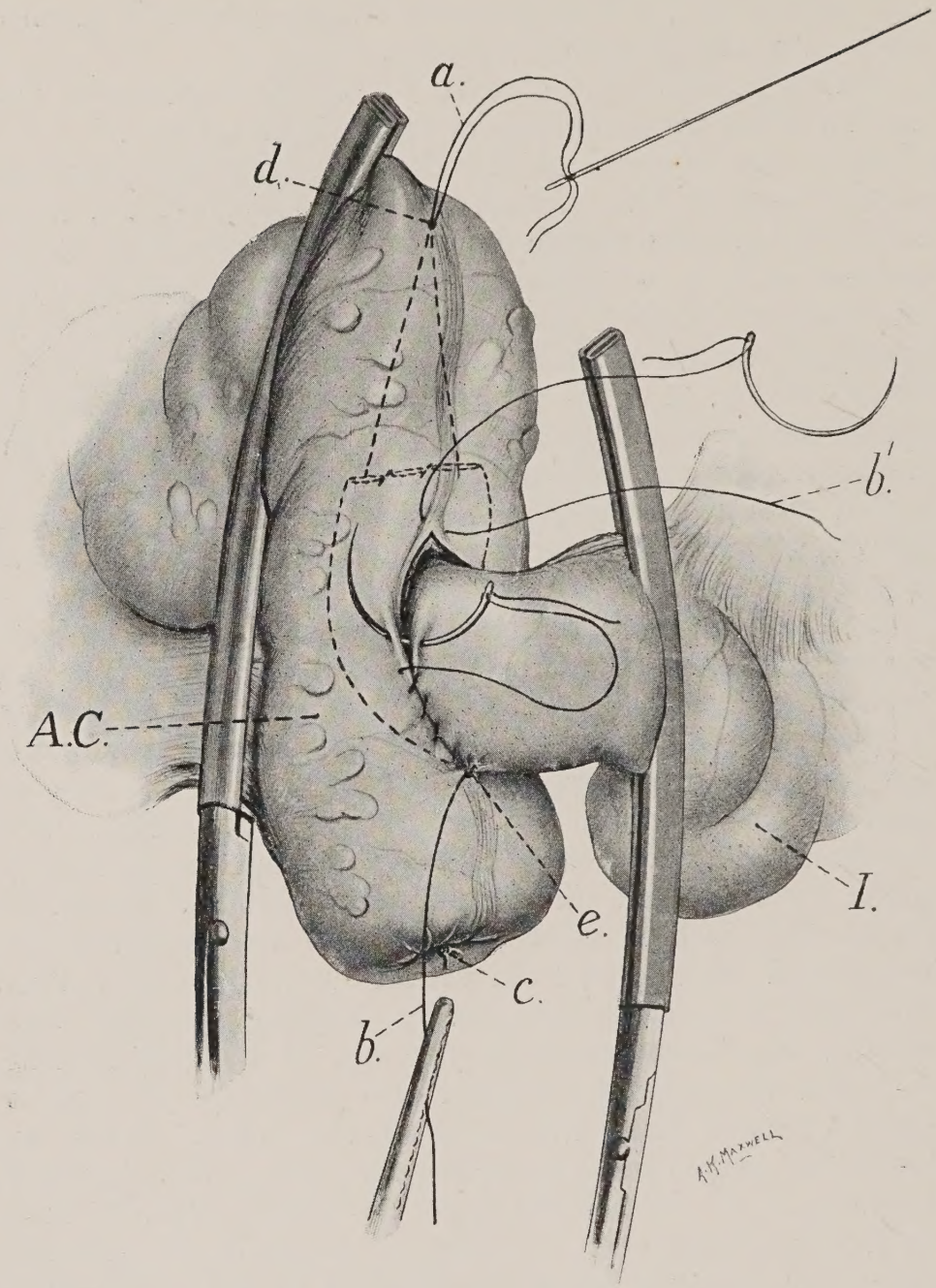


FIG. 30. Intestinal anastomosis by invagination. *A.C.*, *I.*, *a*, *b*, and *c*, as in Fig. 29; *d*, aperture through which the traction suture is brought for pulling on and invaginating the bowel; *e*, where the parts of the two segments are tied together before the suturing is commenced.

the puncture in the colon through which the needle and suture passed (*see* Fig. 31).

When it is a matter of invaginating colon into colon,

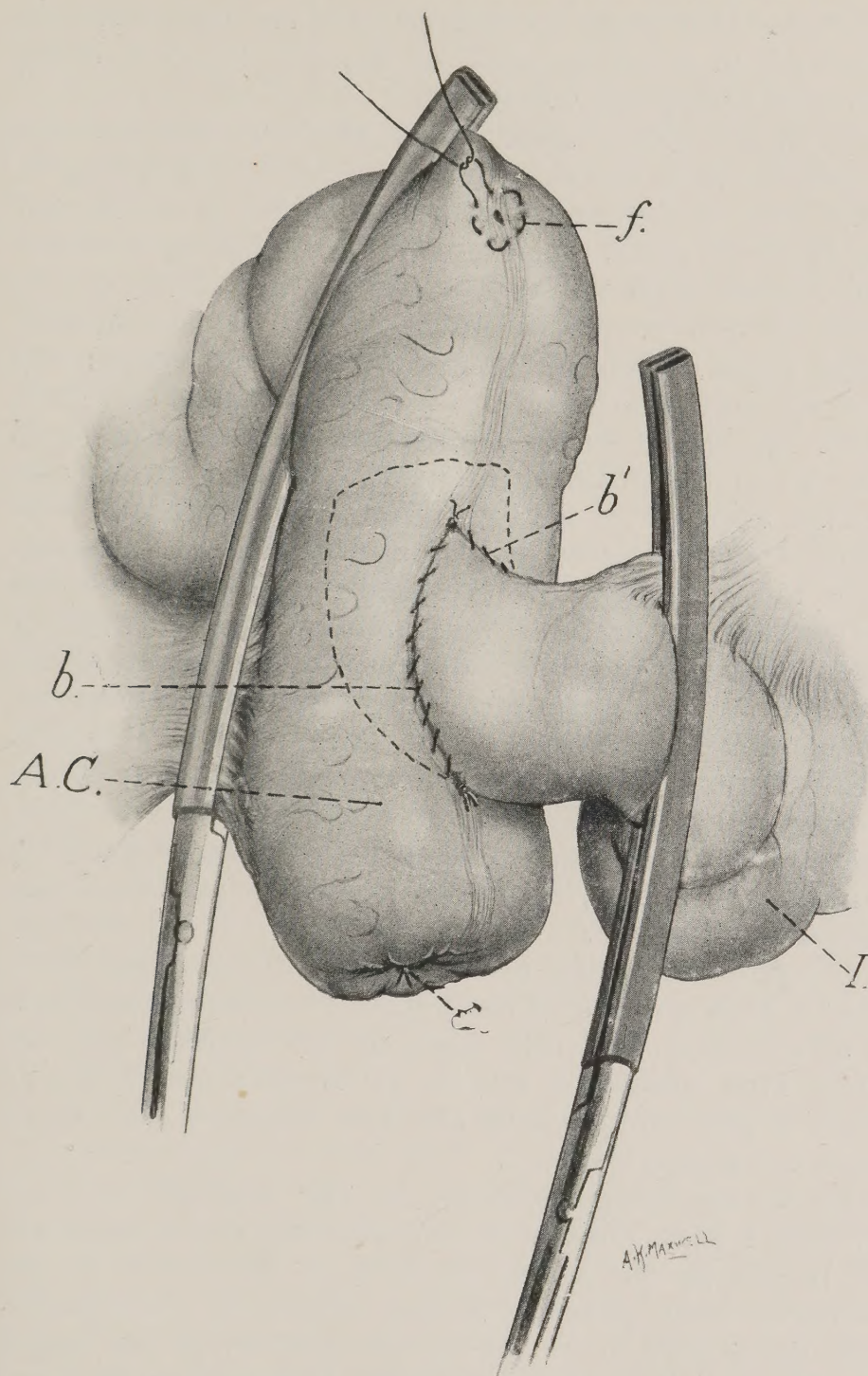


FIG. 31. Intestinal anastomosis by invagination. *A.C.*, *I*, *b*, *b'*, and *c*, as in Fig. 29; *f*, purse-string suture for closing the small aperture of the traction stitch after withdrawal.

the greater bulkiness of the mesocolon as compared with the comparatively thin mesentery of the small bowel,

necessitates that about an inch or so of the former should be tied off in order to allow of the one segment being sufficiently drawn into the other.

In most methods of anastomosis where the line of union is usually between two raw edges, it is considered advisable, for the sake of absolute security, to employ a double row of sutures—an inner, which unites the free margins of the applied bowel orifices; and an outer, which more or less doubles in and covers the inner series. In the present method there is only the free margin of one orifice, and this is united to the intact walls of the invaginated bowel, so that the line of suture corresponds to the outer series employed in the ordinary methods. Further, it may be said that there is no need for more than this single line because the mechanics of the anastomosis is different. Where the free edges of the bowel orifices are united together there is liable to be distension with consequent tension, and the possibility of leakage if a double series of sutures be not employed. In invagination, however, the unimpeded continuity of the bowel wall as it passes through the colonic aperture allows of the contents of the proximal segment to be well and freely propelled into the canal of the distal segment with little or no obstruction at the line of suture, and, therefore, with practically no possibility of leakage.

As regards the after-advantage of invagination it is probable that nothing of the nature of contraction, much less of occlusion, will take place at the opening into the colon. This untoward result, as already indicated, is always a possibility where the raw edges of the bowel orifices are united together.

Another advantage attached to this method, and one to which I have already briefly alluded, is that patients may be fed by the mouth as soon as the effects of the anæsthetic have passed off, the nature of the anastomosis being such as to render the passage of the bowel contents free from danger. This is a matter of no small importance where patients are already suffering from lack of nourishment, as is so frequently the case in carcinomatous and tuberculous diseases. On the other hand, it is not wise to give enemata; and, indeed, to avoid the possibility of retro-peristalsis in the colon, I

believe it to be a good practice to forcibly dilate the anus.

What is the future fate of that portion of the bowel which has been drawn into the canal of the distal segment, it is not possible to say. One might conjecture that it would shrink to some extent ; and one might still further venture on the assumption that it acted somewhat like a valve preventing any backward flow or regurgitation from the distal segment into the proximal. If so, then in cases where the cæcum has been excised, the operation artificially reproduces what Nature ordained should exist in the form of the ileo-cæcal valve, but which disease and surgical intervention had removed.

The entrance into what may more properly be regarded as speculative considerations concerning the advantages of the method must not blind us to the possibilities of untoward results. Thus, the invaginated segment of gut might lead to intussusception, just as is known to happen in cases where there exists a free Meckel's diverticulum. The analogy, however, is not complete ; and the risk may be reasonably regarded as too slight in view of the other obvious advantages of the method.

The best proof of the success of a method, as well as the best assurance that our speculative fears have but little ground for their support, is the practical result obtained ; and that I can instance the case of a man who was perfectly well nine years after I had excised a malignant stricture of the hepatic flexure of the colon and re-established the continuity of the canal by the method of invagination just described, sufficiently meets all the requirements of the argument for and against.

The discovery that our chronic obstruction is due to a *tuberculous stricture*—I say “discovery,” for so frequently it is not until we have opened the abdomen that the diagnosis is definitely confirmed or made—opens up many operative problems for solution.

If the stricture prove a solitary one there is practically no difficulty in the course we should pursue ; if, on the contrary, we have, as is so frequently the case, multiple strictures, then many considerations enter into the question of treatment.

Let us take first the case of a solitary stricture. Not

infrequently, perhaps I should say most frequently, the cæcum, and with it the ileo-cæcal valve, is the part of the intestine likely to be the seat of a single focus of infection. Should this prove to be the case—and we must never assume it is until we have examined carefully the neighbouring segment of the ileum—our method of procedure is clear. There may be, and probably will be, a good deal of pericæcal adhesions; these, while they may add very materially to the difficulty of excision of the part, rarely render total extirpation impossible.

When we have removed the mass, for such it often is, we can re-establish the continuity of the canal by any one of the four methods above described in connection with malignant stricture of the colon. My preference is for the method by invagination; and several successful cases lead me to advise it.

If we have to deal with multiple strictures extending for variable distances up the ileum, and even the jejunum, our methods of relieving the obstruction will have to be determined by the conditions we encounter.

A few words, first of all, on the particular character of the lesions themselves. A tuberculous stricture may be due to the thickening associated with an active process of ulceration, or it may be the result of a cicatricial contraction the sequel to a healed tuberculous ulcer. In the former case there is the probability that the ulcer may heal, if, for a time, the contents of the bowel can be diverted from its passage past the lesion; on the other hand, a healed cicatricial stricture is permanently a stricture, and must remain a constant source of chronic obstruction. The practical significance of this distinction will be understood later.

Our first duty on discovering that the obstruction is due to a tuberculous bowel lesion, is to determine the extent to which the bowel in its length is involved. We shall probably find that the lesions are more frequent as the cæcum is approached; and that they become fewer and at greater distances apart as we ascend the intestinal tract. When we have reached the last ulcer, the question then arises whether the extent of the bowel involved is greater than it is considered wise to remove. It is impossible to lay down any definite measurements; but it

may be taken, as a rough and general rule, that not more than about six feet of the small gut should be excised. It is not that, from a purely operative point of view, much greater lengths may not be successfully removed ; but that, as we exceed the six-foot limit, we begin at once to deprive the patient of parts necessary for the requisite absorption of nourishment, so that the metabolic processes being thus diminished, the patient begins to emaciate ; and this emaciation is quite independent of the quantity and quality of the food taken.

If excision is decided upon, and is possible from the absence of other serious complications, we may, after the removal of the part, adopt any one of the four methods described above. The enormous dilatation and hypertrophy of which the small bowel is capable above the seat of the first stricture, renders, I think, the operation by invagination preferable.

If we are in doubt as to the advisability of removing the bowel on account of the length involved, we should allow that doubt to weigh in favour of retaining the bowel and short-circuiting above the obstruction. The reason for this advice is based on what I said above regarding the possibility of those strictures which are formed by an ulcer subsequently subsiding and allowing the passage of some of the chyme. Life may, at least, be prolonged by the absorption of nourishment which could not have taken place had an extensive excision been executed.

Supposing the conditions be such that excision is impossible, not from the length of bowel involved, but from the extensive adhesions and matting of the infected parts to neighbouring tissues, then the wisest course to pursue is to short-circuit above and below the obstructed region. It is remarkable sometimes how, after such an operation, the conditions improve ; indeed, I have known complete disappearance of the disease. Such cases indicate what power Nature has of overcoming tuberculous infection, and its results, if only mechanical hindrances are removed and the constitution as a whole afforded the opportunity of recouping itself sufficiently to combat the onslaught of the invading tubercle bacilli. I have dealt much more fully with this subject in my work on "Abdominal

Tuberculosis," and illustrative cases are there given at length of what I have just briefly referred to.

When we find that the cause of the chronic obstruction is due to *fibrous and membranous adhesions*, our treatment will depend primarily upon their nature, whether they are limited in size and extent, or whether they are extensive and broad in attachment. But little difficulty may be encountered in the former case; but in the latter there are few lesions more troublesome and, sometimes, more impossible to deal with effectually.

Tuberculosis probably accounts for the most difficult and extensive adhesions we meet with in the general peritoneal cavity; but the severe and intimate matting which is occasionally found in the pelvic cavity of the female is often the result of inflammation of the uterus and Fallopian tubes.

The subject of adhesions has been very fully dealt with in a preceding chapter (*see* p. 80); but it will be advantageous to briefly recapitulate here and amplify to some small extent such parts of that chapter as affect the treatment of chronic obstruction. The extensive adhesions which follow upon a general tuberculous peritonitis often cause obstruction by kinking the gut. It may be possible to liberate such a kink; but the likelihood of the adhesions rejoining only renders it equally likely that the obstruction will sooner or later reappear.

Furthermore, attempts at the separation of extensive and intimate adhesions is extremely likely to damage the bowel wall; for the intimacy of the connections is liable to be of such firmness that the soft, normal parietal tissues are much more readily torn than the tough, adventitious fibrous membranes and bands. This equally holds true, if not with greater force, when coils of small intestine are matted together and to the surrounding parts in the pelvis as the result of previous inflammation.

If, then, we do attempt to relieve the obstruction by the separation of adhesions we must be particularly careful to attend to any lesions of the bowel which have resulted from our endeavours. We must see that torn and abraded peritoneal surfaces are properly infolded; and if the lesion is too extensive to render such simple treatment advisable or possible, we must proceed to excise the damaged part

of the bowel. It need hardly be said, however, that this latter course can only be resorted to in certain cases, for the reason that the adhesions themselves are likely to forbid any sufficient separation and freeing of the implicated segment.

One of the worst cases with which I have had to deal, under conditions such as those just described, was where the bowel was damaged in no fewer than six places. I have fully narrated the case elsewhere, and will not, therefore, further allude to it here (*see p. 98*).

When, then, we have adhesions of such a general character that we cannot hope to obtain the requisite amount of freedom of the bowel, we must short-circuit, securing for the purpose any loop where there is marked distension, and establish a fistula bimucosa between this and a collapsed coil.

How successful we may have been, it is sometimes impossible to gauge; because, while we may have relieved the obstruction we may have formed our fistula so high up in the intestinal canal, that, perhaps, the greater part has been thrown out of action, with the result that the stools are lenteric, and the patient begins to emaciate from physiological starvation. We may feel less doubt in regard to the ultimate success of our anastomosis the lower in the abdominal cavity we have been able to make it.

When we find that a *chronic intussusception* is the cause of the obstruction, it is unlikely that any treatment, short of the most radical, will be of any use. As already indicated, chronic obstruction from this cause is usually met with in the adult; and in these the primary incentive to invagination is a tumour in the wall of the bowel either intra-mural or pedunculated, and projecting into the canal. Strangely, the only case, as far as I can remember, which has come under my own observation for treatment was that of a child, aged three years. It is interesting from several points of view; and I will, therefore, briefly describe it.

Up to four months prior to admission to the infirmary, the child had been perfectly well; but about this time it began to have pain in the lower part of the abdomen. The pain came on in paroxysms, there being two or three

attacks every day. It lasted, more or less, for a month ; and the child then seemed quite to recover for a time. The bowels moved all right during this period ; and nothing abnormal in the way of blood or mucus was seen. Soon, however, the symptoms recurred ; and the child developed what was described as an attack of intestinal catarrh. The pain now complained of was felt, more or less, over the whole abdomen, and began to increase in severity to the extent that the child sometimes felt sick and vomited ; it was always worse an hour after food. Again, the motions were quite normal.

When admitted to the infirmary, the child was seen to be very pale and thin. Its abdomen was greatly distended, and marked peristalsis was visible. Gurgling was often heard. It occasionally cried out with pain in the abdomen. Palpation revealed a somewhat elongated swelling extending upwards in the right iliac region.

The abdomen was opened by a vertical incision, four inches in length, through the right rectus. Immediately distended coils of small intestine made their exit. Digital examination revealed a tumour in the right hypochondrium, which, when delivered, proved to be an intussusception into the ascending colon. As only a slight reduction could be effected, it was decided at once to excise. The mesentery was first tied off with several interrupted ligatures ; the ileum cut through ; and the large bowel severed just above the intussusception. The colon was closed, and the small intestine was implanted into the wall of the colon above its occluded extremity. The abdomen was closed by a single series of silkworm-gut sutures. The child made an uninterrupted recovery ; and left the infirmary quite well about six weeks after its operation.

What was found in this case was certainly not what I had anticipated before operation. Although the symptoms were not such as would admit of any more certain diagnosis than that the child was suffering from chronic intestinal obstruction ; yet I had most in my mind the possible presence of a tuberculous lesion as the cause of the obstruction. The case well illustrates the necessity of being prepared to deal with whatever cause we may encounter. The treatment adopted was sufficiently justi-

fied, not only by the relief immediately afforded, but by the ultimate success which followed.

One pathological feature of distinction between an acute and a chronic intussusception is, that with the latter, inseparable adhesions have formed between the entering and returning layers of the intussusceptum. These adhesions will prevent our reducing the intussusception ; although it may be possible to do so for a certain extent, as was done in the case just recorded. When we have diminished the intussusception to its smallest extent, we must then excise it and re-establish the continuity of the canal by any one of the four methods above described.

But few remarks are required on the treatment of chronic intestinal obstruction the result of external pressure. The relief, when possible, must be afforded by the removal of the agent producing the pressure. With ovarian cysts, uterine fibroids, and such-like removable tumours there may be no difficulty. When, however, it is a matter of growths from any part of the abdominal parietes, or other parts which cannot be removed, relief can only be obtained by circumventing the obstruction ; and this must be done by short-circuiting ; the bowel is divided above the obstruction, the distal end closed, and the proximal planted into some portion of the intestine beyond the obstruction.

CHAPTER XVII

APPENDICITIS

I SUPPOSE that within the last ten years no subject in surgery has been more extensively written about or more freely discussed than appendicitis ; and that from each of the three aspects of Pathology, Symptoms, and Treatment. If one seeks for reasons for this, it is probable that they are to be found in the widespread prevalence of the disease, and in the fact that no surgeon in charge of wards in a general hospital or infirmary fails to receive his full complement of cases.

If a surgeon did not venture to give expression to his

opinions on the subject until his experience had extended to over a series of five hundred cases it is probable that there would be much less diversity of views on the subject generally, and much more unanimity of opinion upon the question of treatment in particular. As my own experience extends to over six hundred cases, I feel less hesitation in promulgating my own views on the varied aspects which the disease presents ; and if any confirmation were needed for the wisdom of waiting for a comparatively ripe experience before ventilating one's opinion, it is to be found in my own case. The presumption—and, I might still more forcibly add, the precocity—which marked my earlier emanations has been justly condemned by the entirely opposite views that I now hold as the result of maturer knowledge.

In what I have to say on the subject, I shall follow the lines originally indicated, and so far traversed in the preceding pages, of attempting no exhaustive or classical discussion of the disease ; but merely give what I have learnt myself during the twenty-two years that these cases have come under my observation. And, first, I will deal with the aspect of Pathology.

Pathology. In by far the largest majority of cases that I have operated upon, retention of the contents of the appendical canal has been an outstanding feature. And, further, almost without exception, the retention has been the result of mechanical causes ; either there has been a constriction or narrowing in some part of the canal ; or the appendix has been acutely bent or kinked from natural or accidental causes ; or its contents have been prevented from passing into the cæcum by reason of one or other of the three following impediments : the unduly pendent position of the viscus in the pelvic cavity, pressure upon it by a distended cæcum, and chronic constipation blocking the appendical orifice in the cæcum.

The retained material may be nothing more than the natural mucous secretion of the canal ; but to this is frequently added that which has been forced into it from the cæcum. As long as the invading substances are not of a pathologically irritative nature, the result may be little more than the formation of oval-shaped masses which vary in consistence from the softness of putty to

the hardness of stone. If from any cause, mechanical or chemical, the contents come to act as an irritant to the mucous membrane of the canal, then we have the first stage of appendicitis. And I believe there is little doubt that we may trace the many and varied symptoms which are attributable to disease of this organ to the initial and subsequent changes to which it is subjected in the advance of the pathological lesion. Let me amplify this statement by considering it more in detail.

The intestinal flora is a very abundant one, rich in pathogenic and non-pathogenic micro-organisms. Nature probably fore-ordained that the latter should alone be the occupants of the canal; but our artificial and acquired methods of living have very largely added, if not been entirely responsible for, the pathogenic species which now so abundantly live and multiply within the intestine. If, therefore, at any time there exists within the cæcum pathogenic micro-organisms, or their products, capable of producing disease, it is not difficult to understand how the migration of these organisms, or the introduction of their toxic products, into the appendix and into an almost occluded portion of it, may supply just the very means required for the production of grave local or systemic mischief.

Now, it may so happen that the chemical irritant, for so it may be regarded, produced no more than a catarrhal inflammation of the mucous membrane; and this in itself may end in complete subsidence with little or no evidence to show—at least to the naked eye—that the organ has been inflamed. On the other hand, the result of this apparently simple inflammation may have ended in the production of permanent local changes, or of evidences of a more general or more remote nature. Thus, the inflammation may have extended through the coats of the appendix sufficiently far to have reached the serous covering; and it is doubtful whether, when this happens, some fibrous adhesions do not remain as a result. It is certainly difficult to explain the frequency with which these adhesions are found except on the assumption that, at some time or another, the peritoneal coat of the viscus has been inflamed.

But we may go further, and justly suppose that the

inflamed mucous membrane has materially lost its power of acting as a barrier to the transit of micro-organisms into the submucous lymphatics, so that a form of toxæmia may result dependent upon the quantity and quality of the toxic agents absorbed. What remote lesions may accrue, as the result of the absorption of toxins by this appendical route, it is probably mere conjecture to assert. But the frequent association which Moynihan states he has observed between duodenal ulcer and adhesions connected with the appendix, has led him to express the opinion that the one is dependent upon the other (*Lancet*, vol. i, 1912, p. 9).

Reverting again to the effects of irritation upon the mucous membrane of the appendix, we may consider the possible progress the inflammation may take if it advance beyond the initial stage of a simple catarrh. When the irritating material is a mass of foreign material, and especially if this mass has assumed the consistency of what we are familiar with as a concretion—and here let me interpolate that I include in the expression foreign materials all such objects as pins, needles, fish bones, cherry stones, &c.—it is more than likely that ulceration of the mucous membrane and submucous tissue will sooner or later result. And, then, if by chance there are pathogenic micro-organisms at hand, they will rapidly assert the fact of their presence by a vigorous development and multiplication in a medium or soil that offers no resistance, but rather encouragement, to the extension of their deleterious influences.

What may be the immediate result of this incursion, whether on a mechanically produced ulcer or on a chemically irritated mucous membrane, will solely depend upon the characters of the invading micro-organisms, and the vigour with which the attack is made. So far as we know, the kind of micro-organisms likely to infect are: the *bacillus coli communis*, the *streptococcus pyogenes*, the *staphylococcus pyogenes aureus*, and the *pneumococcus*. By far the commonest of these is the first—the *bacillus coli communis*. Frequently, however, the infection is mixed.

If we assume the attack to be of the severest kind, the death of the tissues rapidly ensues; and we have the

type of appendicitis usually described as gangrenous. If the progress of the invasion be less acute and less extensive, one of two results may accrue ; on the one hand, the necrotic process may suddenly reach and destroy the serous coat before any protective adhesions have formed, and a perforation result ; and on the other, if the process is sufficiently slow to allow of the peritoneum covering the appendix forming attachments to neighbouring parts, the presence of pyogenic micro-organisms will tend to the formation of an abscess, the results of which will become manifest in many different ways.

While these may be regarded as the sum total of the most likely lesions to be encountered in the appendix itself, and the parts immediately around, there is, throughout the whole stage of advance, when once the mucous-membrane barrier is broken through, the possibility of grave systemic infection either by way of the lymphatics or the blood. If the former route be taken we may get infection carried down into the pelvis, and, more particularly in the female, to the ovary and Fallopian tube ; or it may extend upwards to the diaphragm and result in a subdiaphragmatic abscess. If the blood be the medium by which infection is produced, we have the most serious phases which the disease can assume. It may rapidly kill by reason of the intensity of the toxæmia ; and may be equally fatal, although by a slower process, through the formation of pyæmic abscesses in the liver and elsewhere.

I do not in the least presume to suppose that in the description just given of the pathology of appendicitis I have exhausted all the possible causes of that disease. I merely wish to indicate what has suggested itself to me, as the result of careful observation and thought over a fairly large number of cases, to be probably the commonest causes of the affection. Such a condition as thrombosis of the appendical vessels may take place, causing acute gangrene ; or the appendix may be infected through the blood and not by way of the intestine ; or there may be specific affections to which the viscus is specially liable. I do not in any way deny the possible existence of any one of these causes in certain cases ; only it seems to me that the instances must be very few that cannot be explained in the way I have above indicated.

I have left much unsaid concerning the causes of strictures, kinks, &c., of the appendix ; any discussion of these would carry me without the limits of my object, which is essentially practical, and only concerns the strict bearings of the pathological lesions upon symptoms and treatment.

Symptoms. It is impossible to properly appreciate the symptoms of appendicitis without a fairly clear conception of the pathological lesions which may involve the viscus.

Let me, in the first place, say a few words upon the important symptom of pain.

The nerves which supply the appendix are derived from the superior mesenteric sympathetic plexus, itself a derivative of the great solar plexus. Thus, the nerve-supply of the appendix is, for all practical purposes, the same as that of a considerable portion of the small intestine and the colon. Hence arises the clinical fact that when the pain is of the reflex kind, it is felt in the region of the umbilicus, the same region in which pain is experienced in affections of those portions of the bowel above mentioned. But pain is also felt in the right iliac region. The difficulty is to understand why the reflex umbilical pain is not a constant association of disease of the appendix. It is usually present, and actually so, when the lesion of the appendix is itself an acute one. It is equally difficult to understand why the pain in some cases should be referred to the left iliac region. I have sought more fully to explain these "referred" pains in my book on "Abdominal Pain"; and I would, therefore, prefer to leave any further discussion of the subject, and merely repeat the clinical facts—that pain in connection with appendical inflammation is felt in the right iliac region ; may be referred to the left iliac region ; and, when exceptionally acute, is mostly located at the outset in the umbilical region.

Apart, however, from the production of "referred" pains, other "referred" disturbances may occur as the result of irritation set up in the appendix. In no instance does this appear more marked than in the case of the stomach. We have come to recognise that definite gastric derangements may result from appendical disease ; and

it would be very easy to be misled by the gastric symptoms into the belief that the affection was primarily and solely of stomachic origin were it not for the fact that almost invariably pain is, or has been at some time, felt in the right iliac region. How this disturbance of the stomach is brought about, whether through toxic effects or through reflex nerve influences, I do not know ; but there remains this fact, in support of the association, that removal of the appendix completely cures the gastric symptoms.

The truth of this statement was very strikingly shown in a case of hæmatemesis, which, as is known, is said to be an occasional accompaniment of appendical mischief. The patient was a female, aged thirty years, who was admitted into a medical ward suffering from hæmatemesis and melæna. She was transferred to my ward under the belief that there was some organic lesion of the stomach. She had had several attacks of hæmatemesis accompanied with dyspepsia, the last attack being somewhat severe. It occurred three weeks prior to admission. Laparotomy was performed and the stomach carefully examined, both without and within, but no lesion could be detected to account for the bleeding. The appendix was then sought for and found to have a long mesentery, and to be kinked. It was removed. The patient made an uninterrupted recovery, and was dismissed well four weeks afterwards. She returned to the hospital ten weeks after leaving it to report herself. She was in excellent health, and had had no return of her hæmatemesis.

I now return to the symptoms which may be expected to be found in association with the various stages of the disease met with.

The simple detention of material within the distal part of the viscus, before any inflammation has been excited, can be well understood to cause pain in the region solely as the result of efforts made by the muscle tissue to force out the foreign agent. The very shape and consistency of some of these retained "bodies" suggests that constant efforts must have been made by the canal to rid itself of them ; not to speak, also, of the great hypertrophy of the muscle coat which is so frequently found when, more particularly, a stricture in the canal has been the cause of the retention. I have not dealt with the possible

nature of these strictures ; but the fact that concretions are so common in children seems to suggest that, in many instances, the partial occlusion of the canal must be congenital.

When inflammation has been started, the symptoms will be very materially shaped and modified by the degree and intensity of the process. It is impossible, therefore, to describe any very definite series of symptoms which might be regarded as characteristic of the disease. We may, however, take it that a fairly acute attack of inflammation will produce, in the majority of instances, symptoms sufficiently distinctive.

The patient, after a premonitory period of some hours, and sometimes of a few days, of feelings of ill-defined indisposition, is suddenly seized with an acute attack of pain in the umbilical region. The pain, if not accompanied with, is very soon succeeded by, pain in the right iliac region. There may be, at this stage, a feeling of nausea, possibly accompanied with actual vomiting. A certain amount of rigidity will exist over the seat of the appendix, coupled with marked tenderness to palpation. The temperature will soon rise, and the pulse increase in frequency. When the clinician is confronted with such a sequence of events occurring within the first few hours of the illness, he may take it that appendicitis is, on the simple score of probability, the *fons et origo mali*.

Unfortunately such a picture, clear and distinct as it may seem, by no means paints all the characteristics of the complaint ; nor, still more unfortunately, does it exclude the possibility of its being representative of other conditions quite distinct from, and often only remotely related to, disease of the appendix. I cannot exhaustively deal with the subject of differential diagnosis ; but I may briefly indicate some of the conditions which may simulate an acute appendicitis in its earliest stages. Among these are : perforations of the cæcum the result of cancerous, tuberculous, or stercoral ulceration ; perforation of the cæcum or ascending colon by a foreign body—in a case of my own, a fish bone made its way through the bowel and was diagnosed as an appendicitis ; a suppurative salpingitis ; a ruptured ectopic pregnancy ; and a urethral calculus. The more careful, however, the investigation,

both into the history of the illness and into the local manifestations, the less likely will errors in diagnosis be made.

If we consider the vagaries of appendical symptoms themselves, we are more likely to mistake them as representing something else than to err on the other side of taking any one of the conditions mentioned above for an appendicitis. I have, over and over again, known a case to be diagnosed as some non-appendical disease which operation has subsequently proved to be appendicitis.

The explanation of this confusion and error is partly to be found in the anatomical disposition of the appendix; and the too commonly accepted teaching, that pain is to be elicited by pressure applied in the right iliac region, or at a particular part in this region—the so-called “McBurney point.” There is no doubt that, in the great majority of instances, tenderness is evoked when pressure is made over this area; and is due to the anatomical fact that it is the commonest situation for the cæcum and the appendix. But the cæcum may occupy other positions. In the process of development it passes downwards from its original position high up in the right hypochondrium to its normal seat in the right iliac fossa; and when it possesses a mesentery, or has a very lax attachment to the iliac fossa, it may pass away towards the middle line, and even downwards into the pelvic cavity. Inasmuch as the cæcum carries with it the appendix, the tenderness from pressure, which almost always accompanies inflammation of the organ, is felt only at those parts of the abdomen where the viscus happens to be seated. Hence it follows, therefore, that cases by no means infrequently present themselves in which pressure in the iliac region fails to elicit pain. And, again, irrespective of the locality of the cæcum, the appendix itself may assume positions which tend very materially to affect the seat of the greatest tenderness to palpation. Thus, should the viscus be directed up behind the cæcum and the ascending colon, the region most acutely sensitive to pressure will be the lumbar below the last rib; and should it dip over the brim of the pelvis towards the middle line the most sensitive place is likely

to be the mid-hypogastric region just above the pubes. When the inflamed appendix occupies a position well down in the pelvic cavity, the spot most keenly painful to pressure is reached through the rectum or vagina. In the case of the female the sudden tilting upwards of the cervix by means of the forefinger causes acute pain, and is an excellent means of determining the probable nature of the affection when taken in conjunction with other symptoms; the fundus of the uterus practically acts as an extension of the finger, and so brings pressure to bear directly upon the inflamed organ.

From these few remarks it will, therefore, be understood how little exclusive reliance can be laid upon the classical symptom of pain on pressure in the right iliac region without due regard being paid to other associated symptoms.

The importance which, it will be seen later, I attach to the early diagnosis of appendicitis—within the first twelve hours of the attack—with a view to the proper treatment to adopt, leads me to say a few words more on the signs of the disease at this early period. That an acute attack is often not recognised in its earliest stage is due as much, if not more, to a want of proper appreciation, on the part of the patient or of those in immediate association, of the possible gravity of the symptoms than to any fault connected with the medical attendant. For the real state of matters is generally as follows. The patient, if an adult, frequently thinks that he has some internal disorder, possibly of a merely functional character; and before seeking medical advice he tries some homely remedy first. If the patient is a child, its attack of belly-ache leads the mother or father at once to conclude that it has taken something that has disagreed with it; and thereupon they proceed to dose it with castor-oil or some other aperient; and the result is awaited. As the child becomes no better; or in the case of an adult no improvement follows the remedies tried, the doctor is sent for. This is often not until a day or two has elapsed, when the symptoms have become sufficiently clear for a definite diagnosis to be made. So far the blame, if such misguided efforts can be so called, attaches to the patients and the patients' friends. But there are times, it must be owned,

when the medical man is definitely at fault. He possibly sees the patient shortly after the acute seizure ; and failing to grasp the gravity of the symptoms, puts them down to an attack of colic or some other simple derangement ; and accordingly orders a sedative or an aperient.

That there are many difficulties in the way, both of the public and of the profession, of arriving at a right conclusion of the nature of a case of appendicitis at its earliest stage, I do not for one moment venture to doubt ; but there are fortunately unmistakable indications that these difficulties are becoming less and less, if we may judge from the increasing general recognition which the disease, in every phase of it, is coming to receive. A new generation is rising up trained in the knowledge that any and every acute attack of abdominal pain may be possessed of grave significance. When this knowledge reaches its apotheosis, then the medical attendant will be sent for at the earliest moment ; no treatment will be attempted before he arrives ; and on his arrival he will at once recognise the nature of the disease. He will then advise, and the patient will consent, that prompt surgical measures should be immediately taken. Thus, as I shall presently take as the substance of my text, danger will not be courted because delay has not been counselled.

I now leave the symptoms associated with the earlier stages of the disease, and pass on to those which come to manifest themselves when the inflammation has gone on to suppuration, within or without the appendix.

The different regions of hyperalgesia mentioned above are likely to show considerable augmentation in their sensitiveness to pressure ; and if the local rigidity of the parietes, which almost always accompanies inflammatory affections of the appendix, is not too non-resisting, we may be able to detect a fullness that will add still further to the reasonable assumption, already probably formed, that a collection of pus exists.

It is difficult to say how soon extra-appendical pus forms ; but I believe it is rarely found until after twelve hours have elapsed from the time of the initial seizure. But we may be pretty sure it has formed when, after thirty-six or forty-eight hours, the temperature still keeps up ; or, as sometimes happens, it begins to rise after a

fall has taken place. Some significance has been attached to the presence of leucocytosis in these cases ; or more strictly, to the relative proportion of polymorphonuclear cells to the leucocytes : that when the former are in excess, pus is present or the case exceptionally grave. It is doubtful, however, whether the investigation is of any real clinical value, for those who have directed special attention to the subject of blood-counts are far from being unanimous in their opinion of its practical teaching ; and what, perhaps, is of still more importance, is the fact that the modern treatment of the disease would in no way be affected by the only questionable information the investigation so far seems to afford.

The worst symptoms with which we can be confronted are those arising from perforation and gangrene of the organ ; and unfortunately they sometimes rank among the most confusing and difficult to rightly interpret.

The acute abdominal crisis which we are wont to recognise as significant of a sudden rupture or perforation of an abdominal viscus is very typically represented by the initial symptoms of an ordinary attack of acute appendicitis ; and it is not until other more striking signs of involvement of the general peritoneal cavity arise, that our suspicions are aroused regarding the possible gravity of the lesion. What is most likely to excite our anxiety is, that, after about forty-eight hours have elapsed, we fail to observe that general subsidence of symptoms which will almost certainly follow an uncomplicated seizure dependent upon a simple acute catarrhal lesion ; and instead, we find that the pulse-rate increases, the anterior abdominal parietes become, more or less, generally rigid, tenderness to palpation is more widely distributed, and the patient shows signs of intestinal obstruction, passing neither flatus nor fæces, and with a tendency to vomit. As the resulting peritonitis extends, so do the symptoms of its advance become clearer ; and we can then have not a shadow of doubt of the extremely critical condition of affairs within the abdominal cavity.

If the symptoms of perforation are sometimes difficult to interpret, those associated with gangrene are likely to prove still more so. At least, it may be said that, of all the varied manifestations which inflammatory affections

of the appendix may present, none would seem to be more misleading. The real reason for this is to be found in the particular nature of the lesion, which may be of such a character as to admit of the insidious absorption of toxins into the system without any very marked local indications. The result, therefore, of such a process is that the symptoms partake much more of a systemic than of a local character.

In operating upon this class of cases, we frequently find the appendix quite free of any signs of an active inflammatory process—no adhesions, no exudates, no pus—but merely an excessively foetid necrotic patch of tissue occupying, it may be, quite a limited portion of the parietes of the organ. If an appendix, thus involved, should occupy a position so placed in relation to the abdominal or pelvic parietes that pressure from without cannot be exercised upon it, it is remarkable how little pain may exist or be elicited by our efforts at palpation. This in itself may prove a very misleading feature in the case; and, indeed, has been a frequent source of danger in encouraging delay to operative treatment.

What, then, are the symptoms which we must regard as significant of gangrene of the appendix? The question is easier to ask than to answer. I have known careful medical men thus express themselves with regard to a particular case under their observation—"I don't like the look of him," or "I feel a little anxious that all is not right," or "He is not just so well as I should like," and so on. It is difficult to adequately interpret what these expressions exactly mean; but they are quite clearly significant that, in the majority of instances, the patient is suffering from toxic symptoms. Now these symptoms vary in proportion to the amount and kind of poison that is being poured into the system. It may be only sufficient to make the patient feel a little uneasy—not well: to cause him to have no appetite or a distaste for food. He may appear a little lethargic, and look somewhat heavy, with a slight ashen-grey aspect of the skin. The pulse-rate may not be quickened and the temperature not raised—indeed, the absence of any apparent disturbance of the heart's action or of the body temperature, together with the slightness of the pain, has often led to the

erroneous belief that there cannot be anything seriously wrong. The real aspect of affairs, however, is that these patients are in the early stage of a certainly fatal disease ; and that unless the appendix be removed as soon as possible, the advancing toxæmia will very rapidly place all subsequent endeavours without the range of proving successful.

There is no mistaking the nature of a case that has reached the later stages of toxæmia. The symptoms above described in the incipient stage deepen ; the patient becomes more listless ; the complexion pale and sallow—although with children the face is often flushed ; the eyes appear sunken ; the tongue dry ; sleep is fitful ; the pulse is weak and rapid ; the temperature subnormal ; and there is a complete freedom from pain. It is rarely, if ever, when a patient has reached this advanced stage of blood-poisoning, that the removal of the infecting gangrenous appendix will save life.

Prognosis. I have already stated one fact, that at present we are quite unable to forecast the course which any particular case will pursue when seen at the outset of the seizure. The attack may subside, and it does so in a great many cases ; but the question which is then naturally asked is—Will another attack follow ? Here, again, our power of forecasting future possibilities is negative ; and still further, we cannot say what will be the nature of a second attack, nor when it is likely to occur. There is, however, I believe, little doubt, that an attack of acute appendicitis in a child is more likely to be succeeded by another than in the case of an adult ; and for this reason, that in children it is so frequently the existence of a concretion in the canal that excites the inflammation. It is, furthermore, the probable presence of a concretion in the appendix in early life that often makes the nature of the lesion particularly serious ; for, sooner or later, abscess or gangrene will certainly occur. If a plea for early operation is to find support in any one class of cases more than another, it will certainly be in that of children ; for with the knowledge we now possess of the course the disease is likely to take, in their case, it is impossible to conceive on what ground any one could counsel delay.

With regard to the recovery from an acute attack, we are able to say that a fall of temperature and pulse after forty-eight hours portends, as a rule, a subsidence of the inflammation; but that a rise following upon a fall probably means suppuration and the subsequent formation of an abscess. But assuming that the more favourable course has been pursued, we have no means of knowing whether the appendix will still remain free, or whether the inflammation has extended to the external serous tunic, caused some localised peritonitis, and resulted in the formation of adhesions which may have bound together the appendix and coils of large and small intestine.

Furthermore, we can say that any subsequent attack may be much worse than the original one, for one seizure is no criterion of what another may be like.

Another interesting and important fact about the recurrence of even simple attacks is that each attack may add to the density and extent of the adhesions which form. So intimate, indeed, may these attachments become between the parts of the bowel involved, that the operation to remove the appendix and liberate the adherent parts often ends in damage to the intestine of such a serious nature, that excision of a lacerated loop may be necessary. I have been compelled to remove several inches of small intestine owing to the tearing of the visceral parietes in attempting to separate adhesions.

Much more serious may be the adhesions which follow upon abscess formation; and this notwithstanding the removal of the appendix when operation has been necessary under such conditions. Adhesions of this character may kink the bowel, or in some other way cause acute intestinal obstruction.

As regards the intervals of time which may elapse between recurring attacks, there is the greatest possible variation. It sometimes happens that after the first attack, the patient is never free from vague indications that the mischief still persists; and then, sooner or later, these ill-defined feelings of discomfort increase in magnitude until a definite attack is lighted up. On the other hand, several years may intervene between two attacks. In one of my own cases the patient had remained well for nine years, and then he was seized with symptoms which

necessitated immediate operation for suppurative appendicitis.

Prognosis, as it affects the results of operations, presents several points of interest. The removal of an appendix through a gridiron incision within the first twelve hours of seizure leaves the most perfect and complete result. Of necessity the disease cannot return. No harm is done to the region or the parts from which the appendix is removed ; and the abdomen is as sound as if no incision had been carried through its parietes.

If operation has to be performed when pus is present, it may or may not have been possible to remove the appendix at the time. If it is not taken away it may shrink up and be obliterated in the process of cicatrisation, or it may, and it frequently does, prove a source of subsequent trouble, and necessitate a search for it later. In order to prevent any such possibility, and also to avoid the added risk of trying to remove the appendix at the time of the first operation, it has been recommended by some to adopt the routine practice of first simply opening the abscess, and then, in the course of ten days or a fortnight, when the inflammatory process has subsided, to open the abdomen and search for the appendix.

Two subsequent events are always possible when operation has been performed in the suppurative stage of the disease. These are intestinal obstruction, either acute or chronic, from the constricting effects of cicatricial adhesions ; and a post-operative hernia at the seat of some portion of the parietal wound. These events I shall refer to at greater length when dealing with the subject of treatment.

As regards operations upon perforative appendicitis and gangrenous appendicitis, all will depend upon the extent to which the conditions have advanced. If dealt with sufficiently early before toxic absorption has nearly killed the patient, there is hope that, on removal of the infecting focus, be it the appendix or the purulent material within the general peritoneal cavity, recovery will ensue. These cases naturally constitute the most critical and fatal with which we have to deal ; and those which it is to be hoped we may less and less frequently encounter as the value and necessity of early operation comes to be

recognised. They also rank, at present, among some of the most-to-be-regretted of all abdominal cases ; for it is impossible not to feel that lives so lost are needlessly lost, and come of a lingering lack of appreciation of their gravity on the part of many practitioners who still maintain that appendicitis can be successfully treated by other means than surgical. One of the saddest cases, illustrative of these remarks, that ever came under my observation was that of the only daughter of a medical man. It was his boast that he cured all his cases by the administration of a particular drug. At last his daughter, aged 21 years, the very pride of his life, became his patient. I urgently advised operation, but he would not entertain it. A few days later I was sent for, and operated at once. But a gangrenous appendicitis coupled with general peritonitis and advanced toxæmia placed her beyond all hope of recovery from surgical intervention.

Treatment. To counsel delay is to court disaster. Such is the text which, I believe, now forms the basis of every address, pamphlet, paper, or discussion promulgated by surgeons of experience, on the subject of the operative treatment of acute appendicitis.

Thus did I write in 1895 : " I am disposed to think that most surgeons in this country are not likely to operate, or be called upon to operate, within the first forty-eight hours of an ordinary acute case. I venture to think that were we in the position of the patient and not in that of the practitioner, we should certainly refuse the operation of appendicectomy at the outset " (*see* " Treatise on the Surgery of the Alimentary Canal," p. 509).

Now, after twenty-two years experience, and the observation of over six hundred cases, I believe, so far from such being the opinion of experienced surgeons of to-day, there are few, if any, who would not wish to operate within the first twenty-four, rather I ought to add twelve, hours of an ordinary acute case.

To properly deal with the subject of treatment, it is necessary to consider the measures that should be employed at the different stages of the disease ; and, primarily, I will treat with the case at that period when it is first diagnosed.

Let these two points be conceded : first, that we cannot

tell the course any particular case will pursue ; and, second, that the removal of a free appendix is a perfectly safe and satisfactory operation both in its immediate and in its remote results ; then I fail to see what possible reasons can be advanced for counselling delay. So strongly, indeed, am I of opinion that the removal of the appendix within the first twelve hours of the attack is the right course to pursue, that I believe the day is not far distant when every student will be trained to perform an appendicectomy with as little hesitation as he is taught to execute a circumcision. When this line of treatment comes to be acknowledged, both by the profession and the public, as the right one to adopt, we shall hear very little of deaths from appendicitis. That it will occasionally happen that the diagnosis has been incorrect, and the appendix at the operation found healthy, is but a poor pretext against the performance of a perfectly safe operation which, as the result of its routine employment, would do inexpressibly more good in the prevention of disease and suffering, than could be counterbalanced by any number of comparatively harmless, though unnecessary, exploratory operations.

I will endeavour to convey some practical impression of how simple is the performance of appendicectomy when undertaken before the viscus has contracted adhesions to neighbouring parts ; before an abscess has formed ; and before perforation or gangrene has led to general peritonitis and toxæmia.

1. The pubes is shaved ; the skin cleaned with soap and water ; and painted with tincture of iodine. (These are the only abdominal operations in which iodine is used ; in all other cases the skin is sterilised with carbolic acid, as described in a previous chapter.)

2. An incision, three inches long, is carried obliquely downwards and inwards in the right iliac region, the centre of the incision being opposite, and about an inch and a half to two inches from, the anterior superior iliac spine. This incision divides skin, subcutaneous tissues and external oblique aponeurosis. Any vessels are clamped with pressure forceps.

3. The margins of this incision are drawn aside, and the sheath of the rectus muscle together with the internal

oblique and transversalis muscles divided at right angles to the first incision, and about opposite the anterior superior iliac spine. These parts are then forcibly drawn aside and

4. The peritoneum is cut to the same extent and in the same direction as the skin incision. (2, 3, and 4 constitute what is known as the "gridiron" incision.)

5. The colon is recognised by its anterior longitudinal muscle band, and this serves as a guide to lead to and draw up the appendix.

6. The appendix, when isolated, is held vertically upwards, and its mesentery tied off. The cæcum, about a quarter of an inch from the base of the appendix, is transfixed with a "purse-string" suture; the viscus is cut off close to its base; the mucous membrane which is exposed is touched with pure carbolic acid, the stump invaginated, and finally the "purse-string" suture drawn taut. Such of the cæcum as it has been found necessary to withdraw from the abdomen in order to properly deal with the appendical stump, is returned into the abdomen. If there has been much exposure of the bowel it is wise to freely flush it with some warm saline solution before returning, in order to ensure the removal of any iodine which may have come in contact with the peritoneum, as well as of any other material accidentally deposited.

7. The parietal wound is closed by first passing a continuous suture through the margins of the divided peritoneum, and then uniting together in series, by three or four interrupted sutures, the other margins.

8. The wound and surrounding skin may be again painted with iodine, and the part dressed antiseptically.

As a matter of detail, I may remark that I do not think it advisable to tie the stump of the appendix before invaginating; for this reason, that, notwithstanding the sterilising effect of the pure carbolic acid applied to the mucous membrane, should there still remain a little septic material present it is better that it should have the chance of being poured directly into the bowel than for it to be possibly pocketed in a space between the two ligatures—the stump one and the "purse-string"—where it might lead to further trouble.

In introducing the "purse-string" suture care must be

taken on the following two points : First, that a good grip is obtained of the bowel wall by making the needle traverse the whole thickness of the sero-muscular parietes ; and second, that the suture is passed *under* and *not over* the line of the severed mesentery. The object of these two procedures is to ensure that when the stump of the appendix is invaginated the tightening of the "purse-string" suture effectively occludes all vessels, and so prevents the possibility of blood oozing unchecked into the intestinal canal. I have known serious hæmorrhage accrue in more than one case from neglect in these apparently simple and unimportant details ; and I have regretfully to acknowledge the actual loss of a young girl aged 14 years upon whom I operated for simple uncomplicated appendicitis. The postmortem revealed the true state of matters. Oozing had gone on insidiously and continuously into the bowel ; and although the abdomen was opened, and the bleeding-point at the mesenteric margin secured, too much blood had been lost for recovery to result.

So simple is this operation, when proper attention is given to the points of detail above enumerated, that no skilled assistance is needed for its performance ; for such assistance as is required is merely to hold retractors, forceps, and to cut with scissors.

With what expeditiousness the operation may be performed when adequate assistance can be obtained—such, for instance, as in the case of hospital work—may be judged from the fact that ten minutes is ample time for its execution. I have done cases in six minutes, and one in five minutes thirty seconds, that is, from the first cut of the knife to the tying of the last suture in the skin. I merely mention this to be able to more forcibly emphasise, what I have already expressed, that the operation itself carries with it practically no gravity ; and can, with the simplest ordinary surgical precautions, be executed to the certain prevention of those serious and unforeseen troubles that may happen at any time so long as the appendix remains after it has once been attacked by inflammation.

The really practical value of this teaching finds its greatest confirmation when applied to the practitioner who, away from all expert assistance, has to depend solely

upon his own resources. In large cities and towns where the services of a surgeon can be obtained, or where a hospital can be at once utilised, there may not be the need for the doctor in attendance to undertake the necessary operative intervention; but where no such conveniences exist, the prompt action of the practitioner, encouraged by the simplicity and safety of the operation, will be the means of saving many a life that by simple expectant treatment would have been sacrificed.

When the twelve hours limit has been passed, the simplicity of the case in every phase becomes entirely changed. Instead of a free appendix, with but slight added complications, we may have conditions present that render operative interference both difficult and dangerous; and no longer of a character that admits the liberal advice, regarding treatment, which I have ventured to give when the disease has not advanced beyond its earliest stage.

For the sake of clearly indicating the particular course or courses to be taken, let me assume that the pathological lesion is one in which a localised abscess has formed.

Differences of opinion still exist among surgeons regarding the steps that should be taken. Three courses are practised. First, there are those who prefer to wait until the abscess has reached such a stage that a simple incision through the parietes will liberate the pus, and admit of free drainage. Second, there are those who will at once operate, but will be satisfied with simply opening the abscess, and leave the appendix to look after itself. And third, there are those who prefer the radical course of operating without delay, removing the pus, and searching for and excising the appendix if it is at all possible to do so.

There is something to be said for the adoption of each one of these courses; and while I am myself a strong advocate for, and practiser of, the third course, I do not ignore the advantages attached to each of the other two.

From the point of view of simplicity and safety of operating, there is no question that to open an abscess, when it is comparatively near the body surface, is far and away in advance, in these particular respects, of either of the other two methods. Furthermore, it is the wisest course to adopt when the operator is devoid of special

surgical skill, and is without the conveniences requisite for the employment of more technical measures. The method has, however, this one great and obvious disadvantage, that during the period of delay required for the necessary advance of the pus towards the surface, the patient is exposed to several accidents. The abscess may, for instance, at any time rupture into the general peritoneal cavity, with the inevitable consequences of a general suppurative peritonitis; it may, of course, quite equally well burst into the bowel, and so lead to a rapid subsidence of the symptoms. Septic absorption is always possible; and the patient's feelings of illness are prolonged. Another disadvantage is that when the abscess is opened, it is always possible that a discharging sinus may persist, the result of a residual concretion, or a remnant of the appendix which has not been destroyed, absorbed, or discharged.

Again, the adhesions resulting from a large abscess are likely to be a source of future trouble, for such matting of coils of intestine may take place that acute intestinal obstruction is always a possible subsequent menace to life. And, lastly, the direct incision carried through the abdominal parietes in order to freely drain the abscess cavity may result in a cicatrix that will relax and be the cause of a post-operative hernia. Considering, then, the advantages and disadvantages of adopting this first method I cannot, from the point of view of what I should consider good surgery, regard it one that any surgeon of experience would himself practise; although he would doubtlessly fully recognise the propriety and soundness of counselling delay when technical skill and conveniences were wanting.

As regards the second course—that of always removing pus when it is considered to be present, but not necessarily attempting to excise the appendix—an operation is introduced which requires both skill and care. Like the preceding course it has its advantages and disadvantages. The former consist in the important facts that the patient is relieved of a focus of infecting material; that any further progress of the disease is to some extent checked; and that the possibility of additional adhesions being formed is very much lessened. The disadvantages lie in the facts that the appendix with its contained substances is left;

that this, therefore, may cause a persistence of local mischief, if not be the means of evoking a recrudescence of the disease at some future time. The operation itself, also, is not free from risk ; and more particularly does this apply to those cases where no protective adhesions have formed between the abdominal parietes and the involved appendicular region ; so that the abscess cavity has to be approached through the open and free general peritoneal cavity. How this risk may be prevented will be discussed when dealing with the third course. The fact that the appendix may subsequently give rise to trouble has led some surgeons, who advocate this particular method of operating, to systematically re-open the abdomen some ten days or a fortnight later, when all inflammatory mischief has subsided, and remove the appendix. It will, of course, in some cases entail an unnecessary procedure, because, as already stated, the result of abscess formation may be the complete destruction and removal or absorption of the viscus ; and a perfect cure, therefore, of the disease. Whatever security such a secondary operation may afford a certain number of cases against a subsequent attack, the performance of two separate operations is not likely to commend itself to patients who have already experienced the discomforts connected with one.

The third course or method is the most severe and radical of all ; but its successful accomplishment at once relieves the patient of all immediate risks, though not, for reasons which will be given later, of all possible deleterious consequences.

I will outline the particular way in which I am in the habit of practising this method, and leave any comment upon it until after its description.

1. The abdomen is opened in the right iliac region by the usual "gridiron" incision. Should more room be required the incision must be carried either upwards or downwards, dividing the fibres crossways of the internal oblique and transversalis muscles. This extension of the wound should always be avoided, if possible, as rendering the subsequent formation of a hernial protrusion much more likely.

2. If there are no adhesions encountered between the

visceral and parietal peritoneum sufficient to effectually cut off the general peritoneal cavity, gauze plugs are inserted so as to afford complete protection of the cavity when the abscess is opened.

3. The abscess is now sought for by carefully breaking down the adhesions, and when once pus begins to well up it is rapidly swabbed away until the cavity has been freely exposed and practically dried.

4. The appendix is then sought for, and, if reasonably possible, removed; the cæcal stump is touched with pure carbolic acid, and invaginated by a "purse-string" gut suture.

5. The abscess cavity is freely wiped with a small gauze swab soaked in pure carbolic acid. An effort is made to reach every part of the cavity. A dry swab is then introduced to soak up any of the remaining acid, and immediately thereafter any amount up to half a teaspoonful of iodoform is put into the cavity, and with a blunt instrument smeared over its walls.

6. A rubber drainage tube, about a quarter of an inch in diameter, is conducted to the lowest part of the cavity, and on one side of the tube a narrow strip of iodoform gauze is packed in zigzag fashion, just sufficient to fill the cavity; this, with the tube, is conducted out of the abdomen about the centre of the wound.

7. The protective gauze plugs encircling the involved area are withdrawn, the edges of the wound dusted with iodoform, and closed by through-and-through silkworm-gut sutures.

The after-treatment is as follows: On the second day after the operation the iodoform gauze packing is partially removed; on the third day it is completely removed; and, however foetid may have been the pus at the time of operating, the plug will be found to be perfectly "sweet." On the fifth or sixth day the drainage tube is taken away, and on the tenth day the stitches are removed. At the end of four weeks the patient is allowed up.

The advantages of this method may be summed up as follows:

1. That, where proper precautions are taken to protect the general peritoneal cavity, this method of operating admits of every abscess being opened and every appendix sought for and removed with perfect safety.

2. That this method prevents any subsequent septic complications, such as subdiaphragmatic abscess, pylephlebitis, pneumonia, thrombosis, and other septic manifestations connected either with the wound locally or with deeper and more distant parts.

3. That, as drainage is considered advisable in every instance, the probabilities are in favour of a weakened cicatrix at the seat of exit of the tube and gauze, with, later, hernial protrusion ; but, provided the incision is of the "gridiron" variety, with no cross-division of muscle or aponeurotic fibres, and neither the tube too large nor the packing excessive, the bulging may be only slight ; and sometimes non-existent.

This particular method I described in a paper to the *British Medical Journal* (1911, vol. i, p. 676) under the heading of "The Treatment of Appendical Abscess with Pure Carbolic Acid and Iodoform." At one time I tried to avoid drainage, hoping that the carbolic acid and iodoform would sufficiently sterilise the abscess cavity to admit of closing completely the abdominal wound, and so preventing the formation of post-operative hernia. Often one succeeded ; but, now and again, an accumulation took place, and the wound had to be reopened to allow of pent-up material—often very foetid—escaping. In the end there was no gain ; and I elected, therefore, always to act on the safe side, and drain in every case in the way described. The reason, I think, for this reaccumulation occasionally happening is that the irregularity of some abscess cavities is such that the antiseptic media do not get in touch with all parts.

If this method of dealing with appendicitis coupled with abscess formation has one disadvantage, it is that it is not a method to be undertaken by any who do not fully appreciate that it has grave risks if the necessary precautions are not adequately taken ; but if executed with due respect to these, and by one capable of dealing with all contingencies, it at once relieves the patient of any further danger.

When the abscess is large and fills more or less the pelvic cavity, it should, if possible, and as a preliminary measure, be opened by way of the rectum. A collection of pus so situated presents very distinct local symptoms.

A digital examination per rectum reveals a soft œdematous condition of the mucous membrane; and if the amount of pus be sufficient, a distinct sense of fullness will be detected, amounting sometimes to a bulging into the canal. This added condition of proctitis also causes a secretion of mucus from the involved and inflamed mucous membrane. When, then, we encounter this local manifestation, a long straight bistoury should be thrust into the most prominent part of the swelling. Immediately pus is seen to escape a director should be introduced alongside of the blade into the abscess cavity. The knife is then withdrawn, and the director used as a guide for the insertion of a long pair of dressing forceps, the opening of which dilates the incision for a sufficient extent to admit of the introduction of a drainage tube. This tube should be maintained in position, if possible, for at least forty-eight hours; after which time the cavity will have contracted and so have emptied itself. If the tube should, by accident, be forced out before complete evacuation, it should be replaced, a procedure which can be easily effected by the aid of the forefinger passed up to the opening.

This treatment sometimes results in a complete cure; and if it does so, it usually implies that the appendix has been destroyed in the suppurative process. On the other hand, a recrudescence of the symptoms may take place at any time afterwards. In such cases, the usual operation for the removal of the appendix in the right iliac region should be performed.

The advantage of the rectal route in these cases of large collections of pus, is that it renders drainage much more effectual, and certainly safer, than when emptied from above. If the removal of the appendix is subsequently deemed necessary, it is carried out under much more favourable conditions.

Acute intestinal obstruction is unfortunately a by no means infrequent occurrence as a sequel in these cases of abscess formation; and, I should add, it is more particularly so when the pus has been located in the pelvis. The adhesions which, as already pointed out, result from the more extensive inflammatory processes, are very liable to cause loops of intestine to be kinked or acutely

bent. I have more than once had to operate upon a case only a few days after appendicectomy. All seemed at first to go well; and then the patient complained of colicky symptoms coupled with occasional attacks of vomiting, followed by unmistakable symptoms of complete obstruction. The cause was found to be the binding down of a loop of intestine which had found its way into the pelvis, become adherent to the inflamed tissues, and so obstructed.

It would be fitting to introduce here a few remarks on the subject of post-operative hernia. It is a sequel in many cases where, from any cause, it has not been found possible to finish the operation by the simple "gridiron" incision, and completely close the abdominal wound.

Some time ago, with the help of my resident assistant, Dr. Kinloch, I looked up a number of my cases in which, at the time of operation, pus was present, to ascertain the frequency with which a weakened cicatrix or a hernia resulted. I deemed the information obtained to be of sufficient interest to publish it. The "Table" of cases I introduce here (*see over*). The operation performed in each case was that described under the heading of "the third course or method" (*see p. 289*). Drainage and a certain amount of iodoform packing was, therefore, used in each instance.

In commenting upon the various items which this Table contains, it will be noticed, first, that in sixteen out of the twenty-seven cases the abscess was reached by the ordinary "gridiron" incision, neither muscle nor aponeurosis being divided across the direction of their fibres.

Secondly, in every instance the peritoneal cavity was opened—that is to say, the abscess had to be reached through the non-adherent walls of the visceral and parietal peritoneum.

Thirdly, in twenty-five cases out of the twenty-seven the appendix was sought for and removed. In one of the remaining two it was only partially removed, as a portion had disappeared, while in the other it could not be found.

Fourthly, every case recovered, and in none were there any subsequent complications, such as subdiaphragmatic abscess, pylephlebitis, pneumonia, or other conditions suggestive of septic absorption or local accumulations.

TABLE OF CASES OF UNCOMPLICATED APPENDICAL ABSCESS TREATED BY DRAINAGE WITH RUBBER TUBES AND IODOFORM PACKING

No.	Sex	Age	Nature of Abdominal Opening	Date of Examination after Operation	Condition of Cicatrix: <i>a.</i> Reply by Letter; <i>b.</i> Patient seen and examined
1	F.	37	Gridiron; no cross-division of muscles	Years 4 $\frac{3}{4}$	<i>a.</i> Bulging at site of drainage tube
2	M.	22	Incision in median line over situation of abscess	4 $\frac{3}{4}$	<i>b.</i> Ditto
3	F.	12	Gridiron; no cross-division of muscles	4 $\frac{1}{2}$	<i>b.</i> Ditto
4	F.	34	Internal oblique and transversalis muscles divided upwards	4 $\frac{1}{2}$	<i>a.</i> No bulging
5	M.	53	Gridiron; no cross-division of muscles	3 $\frac{5}{6}$	<i>b.</i> Ditto
6	F.	12	Ditto	3 $\frac{3}{4}$	<i>a.</i> Ditto
7	M.	22	Ditto	3 $\frac{1}{2}$	Case not traced
8	M.	17	Internal oblique and transversalis muscles divided downwards	3 $\frac{1}{4}$	Ditto
9	F.	10	Gridiron; no cross-division of muscles	2	<i>a.</i> No bulging
10	M.	51	Internal oblique and transversalis muscles divided upwards	2	<i>b.</i> Ditto
11	M.	39	Ditto	2	<i>b.</i> Bulging at lower part
12	M.	21	Gridiron; no cross-division of muscles	2	<i>b.</i> Marble-size bulging at site of drainage tube
13	F.	5	Internal oblique and transversalis muscles divided upwards	1 $\frac{1}{2}$	<i>b.</i> Bulging at lower part
14	M.	40	Internal oblique and transversalis muscles divided downwards	1 $\frac{1}{2}$	<i>b.</i> Considerable bulging for about 5 in.
15	M.	34	Gridiron; no cross-division of muscles	1 $\frac{1}{2}$	<i>b.</i> Bulging at site of drainage tube
16	M.	13	Ditto	1 $\frac{1}{4}$	<i>b.</i> Ditto
17	M.	11	Ditto	1 $\frac{1}{6}$	<i>b.</i> Ditto
18	M.	21	Internal oblique and transversalis muscles divided downwards	1 $\frac{1}{6}$	<i>b.</i> Slight bulging at lower part

TABLE OF CASES OF UNCOMPLICATED APPENDICAL ABSCESS
TREATED BY DRAINAGE WITH RUBBER TUBES AND
IODOFORM PACKING—*continued*

No.	Sex	Age	Nature of Abdominal Opening	Date of Exami- nation after Opera- tion	Condition of Cicatrix : <i>a.</i> Reply by Letter ; <i>b.</i> Patient seen and examined
19	M.	17	Internal oblique and transversalis muscles divided downwards	Year 1	<i>b.</i> Bulging marked at lower part
20	M.	8	Gridiron ; no cross-division of muscles	$\frac{1}{2}$	<i>a.</i> Slight bulging
21	M.	27	Ditto	$\frac{1}{2}$	<i>b.</i> No bulging
22	F.	44	Ditto	$\frac{1}{2}$	<i>b.</i> Bulging at site of drainage tube
23	M.	16	Internal oblique and transversalis muscles divided upwards	$\frac{1}{4}$	<i>b.</i> Ditto
24	M.	29	Ditto	$\frac{1}{4}$	<i>b.</i> No bulging
25	M.	22	Gridiron ; no cross-division of muscles	$\frac{1}{4}$	<i>b.</i> Slight bulging at lower part
26	F.	17	Ditto	$\frac{1}{4}$	<i>a.</i> Slight bulging
27	M.	56	Ditto	$\frac{1}{12}$	<i>b.</i> No bulging as yet

NOTE.—The appendix was removed in all cases except No. 4, where removal was partial, and No. 24, where the appendix was not found. The peritoneal cavity was opened in all cases ; there was no subsequent complication in any, and the result in all was recovery.

The pulse and temperature usually fell within twenty-four hours.

Fifthly, the subsequent results of operation were traced in twenty-five out of the twenty-seven cases, and nineteen of these twenty-five were seen and examined. With the exception of the twenty-seventh case, which had only been operated upon a month previously, the interval between operation and report ranged from three months to four and three-quarter years. An examination of these results shows : (1) That where the "gridiron" incision was employed, in ten out of fourteen cases there was some bulging of the cicatrix, mostly slight and in almost every instance at the place where the drainage tube and gauze

packing emerged. (2) That where the internal oblique and transversalis muscles were cut across by extending the incision upwards, three out of six cases showed bulging, the protrusion being in one case at the seat of exit of the drainage tube, and in the other two at the lower part of the cicatrix. (3) That where the internal oblique and transversalis muscles were cut across by extending the incision downwards and inwards the three cases so treated showed bulging—in one, “considerable bulging for about 5 in.”; in a second, “marked bulging at lower part”; and in a third, “slight bulging at lower part.” Thus, then, it is seen, in reviewing these results collectively, that out of twenty-three cases only seven showed no signs of bulging, and lapse of time may even lessen still more the number of these latter. Further, the bulging was least in those cases in which a “gridiron” incision was employed with no cross-division of muscle or aponeurotic fibres. And, lastly, that while the number of cases is possibly too few to admit of a very positive statement—nine in all—where the incision had to be carried either upwards or downwards, it seems probable that downward extension is more likely to be followed by a bulging cicatrix than upward.

It is impossible, after this study of cases, to conclude otherwise than that another argument is added in favour of early operation if for no other purpose than that of preventing the possible sequel of hernia, which, it is clearly shown, is so likely to result after operations for purulent appendicitis.

To enforce somewhat more fully the fact that these herniæ may assume considerable and serious dimensions, I introduce a photograph (Fig. 32) taken of a girl who was operated upon, at the age of fourteen years, for gangrenous appendicitis coupled with general peritonitis and the presence of a quantity of fœtid pus in the pelvic cavity. The operation was performed two and a half years before the photograph was taken; drainage was employed, as also a certain amount of packing of the appendical region. The subsequent course of the case was that a fæcal discharge took place from the wound; and it became very septic. Three months after the operation there was still a slight leak from the wound.

Her recovery was further delayed by an empyema which developed about four weeks after the operation. The hernia was successfully dealt with in the way already

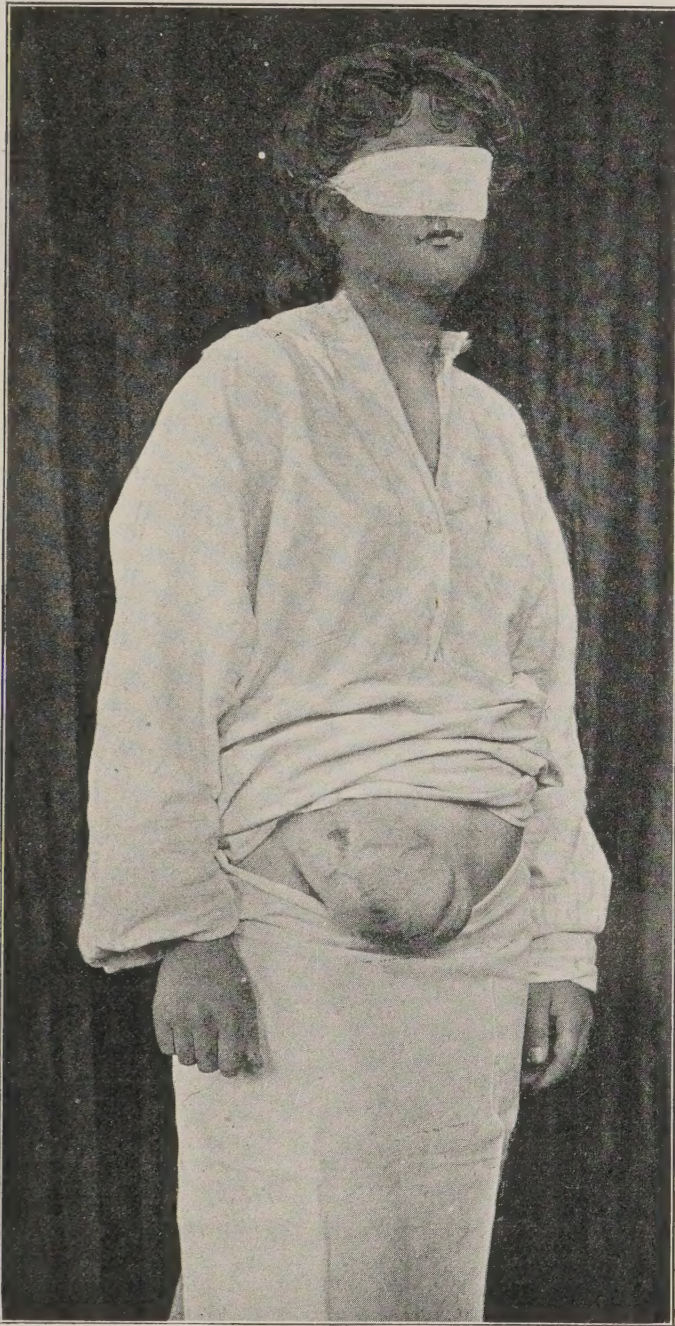


FIG. 32. Post-operative hernia. The operation had been performed two and a half years previously for gangrenous appendicitis and general suppurative peritonitis. Both drainage tubes and packing were employed; a faecal fistula followed.

described (*see* p. 63), that is to say, after excision of the sac and the return of its contents, the skin with subcutaneous tissue, the external oblique aponeurosis, the internal oblique and transversalis muscles, and the peritoneum were each freely exposed in their respective layers, and reunited together as after an ordinary "gridiron" incision.

The treatment which we may be called upon to adopt when the conditions are no longer localised—when, in place of a shut-up collection of pus, we have diffuse distribution of septic exudates with consequent general peritonitis and toxæmia—is a matter of much more serious moment than any phases of the disease we have as yet considered.

We may sometimes have symptoms sufficiently clear to indicate that the peritonitis is directly the result of an appendicitis. On the other hand, it may frequently happen that it is only the operation that enlightens us upon the fact that the peritonitis is due to appendicitis. In the one instance, we are better prepared how to deal with the case; in the other, we must nevertheless equally be ready to act as if we had been forewarned. Immediately on opening the peritoneal cavity sero-purulent fluid escapes; this is usually quite scentless; it is not until the pus immediately connected with the diseased appendix is reached that the typically foetid smell is obtained. Our duty is first to remove the appendix; and then carefully swab away as much as we can of the purulent fluid, which, as a rule, will be found mostly located in the pelvis. After this, I believe it to be right to pass a large rubber drainage tube well to the bottom of the pelvic cavity. Whether a pack of iodoform gauze should also be introduced will, to some extent, depend upon circumstances. If there is much mischief in the appendical region, I prefer to stuff this particular part; but if no such marked limited focus exist, draining with a tube only, I think, is sufficient. I have often felt that packing with gauze causes the subsequent formation of a fæcal fistula. Whether this is really the case I cannot definitely say; but believing it probable, I prefer as much as I can to avoid its use, and trust more to free and adequate drainage.

Much depends on the proper after-treatment of these cases. The patient should be placed in the inclined position, so that the exudates may gravitate as much as possible towards the bottom of the pelvic cavity. Any upward extension of the septic fluid is to be carefully avoided; for absorption in the upper regions of the abdominal cavity leads to rapid and fatal toxæmia.

The introduction of salines — proctoclysis, as it is termed—has proved an important item in the matter of after-treatment. Special appliances are devised for this purpose; but it is better to rely upon the simpler method of introducing small quantities of saline slowly and at frequent intervals with an ordinary urethral catheter and a filler; such common requisites are always at hand.

The use of drugs in the treatment of appendicitis in any of its phases can hardly be entertained if there is any truth in the statements which I have made regarding the probable pathology of most cases. No medicine can possibly remove pent-up or retained secretions or foreign bodies in the appendical canal. Where chronic constipation is known to exist, the suitable employment of aperients may act beneficently in removing any obstruction from the orifice of the appendix at the cæcum.

It is a popular idea, and once was a professional one, and, perhaps, is so to some extent still, that castor oil, calomel, magnesia, or some other purge should be administered. If not actually harmful, they must now, at least, be regarded as useless.

The relief of pain is a consideration that must be entertained; and so long as morphia is solely used for that purpose, and in no sense as a curative agent, there can be no very cogent reason for withholding it. It, however, becomes a real source of danger if it blinds into the belief that because the patient is easier he is, therefore, better; and that, in consequence, the question of operation is postponed. Except, then, for the relief of pain it should never be used; and certainly, given in the presence of toxic symptoms, it may prove extremely prejudicial. It is probable that opium in any shape or form tends to check secretion and excretion; and if in this disease the normal exercise of one function is more important than that of another, assuredly it is that which tends to rid the

circulation of such products as are deleterious to the whole system.

Towards the attainment of this desirable end, and in order to stimulate rather than depress the secretory and excretory functions, aperients and copious diluents should be given within a reasonable period *after operation*. It is my usual custom, if the bowels have not moved by the third day after operation, to administer drachm doses of magnesium sulphate hourly until the bowels act. The "action" may be accelerated by giving a soap-and-water enema. My preference for magnesium sulphate is based on the fact that, as it produces more watery evacuations, it is likely to have some beneficial depleting effect upon congested and inflamed areas in the appendical region. At the same time, Epsom Salts do not as a rule cause griping pains. However, the principal object aimed at is an evacuation; and if calomel or castor oil is readier at hand one or the other should be used.

How long should a patient be maintained in the recumbent position after the operation of appendicectomy? To avoid repetition, the answer to the question will be found fully considered in the chapter on "Hernia of the Abdominal Parietes" (*see p. 50*).

I may add a word or two, before concluding, on the use of vaccines, both as preventive and curative measures. Inasmuch as the micro-organisms most frequently present are the bacillus coli communis, and the staphylococcus pyogenes aureus, the vaccines to be employed are made from cultures of these organisms. How much the routine administration of a mixed stock vaccine is likely to act as a preventive against subsequent toxæmia, it is difficult to say. When surgical treatment in itself is so often successful, there is the danger of attributing to the possible beneficial effect of the vaccine that which is really due to the operation. If it is certain that we do no harm by the introduction of the vaccine itself there may be no objection to its routine employment as a possible preventive measure. Personally, I do not feel disposed to adopt such a supposed preventive precaution until I am more convinced that it is under any circumstances capable of effecting some good.

There is something to be said, theoretically, in favour

of the employment of vaccines in cases of evident toxæmia, although much more practical experience is required than is at present forthcoming. I have in this particular class of cases employed both a stock vaccine and one made from pus taken from the patient to be treated ; but the results obtained were so at variance with one another that I feel, personally, I can express no definite opinion on the matter.

CHAPTER XVIII

ACUTE GENERAL OR DIFFUSE PERITONITIS

LET me clearly indicate what I do not and what I do intend to deal with in this chapter. It is necessary that the definition should be distinct ; for it so frequently happens that under the title of Acute General Peritonitis various purely local infections are included ; and, in consequence, the utmost confusion results regarding both the symptoms and treatment. This is very strikingly illustrated in the discussion which took place at the annual meeting of the British Medical Association in 1911, when the subject to be treated was "General Septic Peritonitis." Both the introducer of the subject and those who followed in the discussion wandered over a much wider field than the title strictly admitted ; and, in consequence, it was often difficult to trace the connection between remarks given expression to and the subject really under discussion. In extenuation, however, of these often diffuse and somewhat wandering opinions, it must be frankly admitted that it is sometimes very difficult to draw a hard-and-fast line between what is to be considered simply local and what ought to be regarded as general ; in some instances, one is undoubtedly merely an early stage of the other. In fact, one might almost venture to say that no peritonitis is general in its origin. There is a focus from which the disease proceeds ; and whether that focus is to remain localised or become generalised must depend upon accidents associated with the nature of the infecting agent, and the rapidity with which it progresses—the less acute the one,

and the slower the process of advance, the more likely is the result to be a localised peritonitis.

The real point of confusion enters when the peritonitis at the focus of infection advances considerably before a limiting check is reached ; so that, for instance, it might happen that, in certain cases, a considerable part of the lower peritoneal cavity would be involved. In many appendical affections, and in inflammatory diseases of the female pelvic viscera, this more extended involvement of the peritoneum is met with ; and when so encountered is very frequently described as a case of general septic peritonitis. It is not easy in many cases of this class to say beforehand that the case is not one of general peritoneal infection, for the whole abdominal parietes may be rigid and tender to pressure. But in these circumstances the favourable results obtained by surgical intervention ought not to be accepted or classified as, in any sense, part of the general statistical records of the treatment of general septic peritonitis.

Thus, then, I think it will be understood that I do not include cases where the infection has become limited and localised. The class of cases dealt with is exclusively that in which no limiting adhesions have followed upon the introduction of an infecting agent into the free and non-adherent peritoneal cavity : the whole cavity becomes, more or less, rapidly invaded, with the consequence that constitutional symptoms, if not already present, rapidly make their appearance.

When the subject is considered on these clearly defined grounds ; and the conditions are constantly borne in mind in discussing the anatomy, pathology, etiology, symptoms, diagnosis, and treatment of the disease, but little confusion can follow in the various opinions given vent to regarding one or other of these matters.

Anatomy. A proper understanding of the anatomy of the peritoneum will explain and make clear a good deal of what is subsequently said on the subject of pathology, symptoms, and treatment.

The peritoneum is practically an analogue of the skin, and has been computed to be about equal to it in surface area. It covers, to variable extents, almost all the abdominal viscera ; and so provides a protection for them, and a

means by which those that are mobile can harmlessly move the one over the other. In the male the peritoneum forms a completely closed cavity ; in the female the Fallopian tubes open into it.

The peritoneum is abundantly supplied with blood-vessels and nerves ; but its degree of sensibility to mechanical and chemical impressions varies considerably. Thus the peritoneum forming the mesenteries, mesocolons, and that lining the abdominal parietes is very sensitive. The peritoneum secretes just sufficient material to lubricate its surfaces ; but when congested or inflamed pours out an abundant serous exudate. Absorption is freely exercised, and this much more markedly in the upper than the lower abdomen ; it is probably freest on the under surface of the diaphragm.

Pathology and Etiology. There is no reason to assume that the peritoneum differs from other lining membranes in being less liable to inflammation when unduly irritated ; nor need it be supposed that inflammation when it attacks it differs in any material respect from similar processes elsewhere. Its becoming inflamed under any circumstances should be regarded as partially a protective process. It is Nature's effort to counteract and to inhibit the incursion and onslaught of invading forces which are inimical to the general welfare of the system as a whole. The rapid effusion, therefore, which succeeds an active congestion of the membrane may have, indeed probably has, a neutralising and destructive effect upon these invading forces whatever they may be. The exudate seems, also, to have an additional protective power, for it tends to cement together adjacent surfaces, so that further extension of infecting material is prevented. It is sometimes remarkable how the omentum seems to assist in this respect ; for not only may it be found in helping to seal up a focus on the lower abdomen, but it will limit extension from a lesion in the duodenum, gall-bladder, or stomach.

The chief interest about an attack of acute general peritonitis centres in the mode of infection. As far as is known there is no such thing as an acute specific infection of the peritoneum, as a whole, that is, independently of any disease elsewhere ; there is always a definite focus from which the inflammation starts. Further, everything tends

to show that it is the presence of a particular microbe in the general peritoneal cavity that excites the inflammation. At present the micro-organisms known to have this power are the staphylococcus pyogenes aureus and albus, the streptococcus pyogenes, the pneumococcus, the bacillus coli communis, and the gonococcus. In many instances, the infection is mixed, that is to say, the bacillus coli communis, for instance, may have in conjunction with it some of the aureus ; or the same micro-organism may be mixed with the pneumococcus ; and so on. The virulence of any attack will depend both upon the quantity and quality of the micro-organisms finding their way into the general peritoneal cavity ; and probably also upon the resisting powers possessed by the host.

How do these micro-organisms gain access to the general peritoneal cavity ? In the case of the female they can easily do so by way of the Fallopian tubes ; and it is by this route that such microbes as the gonococcus, the pneumococcus, and the pus-producing organisms probably do. Under all other circumstances, they must either make their way through the unbroken surfaces of the peritoneum, or be ejected through some perforating lesion of a viscus. There is no difficulty in understanding the latter process, but in the former case we must assume that the serous coat has been damaged by an inflammatory process which has started from within, and, by extension outwards, impaired the protective properties of the membrane. This doubtlessly happens in some cases of chronic catarrhal colitis, and in the acute ulcerative form of the disease. When inflammation arises from a gangrenous or ruptured appendix, or an inflamed bowel, it is usually the bacillus coli communis that is the infecting agent, although other micro-organisms are often associated in the process.

The infection which arises from a perforated gastric or duodenal ulcer is, as a rule, not acute in its inception, but rapidly becomes so after six hours or more. If any doubt existed as to the universality of a bacterial origin of all cases of acute general peritonitis, it would be in the case of a perforated gastric ulcer ; for, except that the ulcer is itself probably septic, the extravasated material is not necessarily so ; and the peritoneal inflammation might be chemical in origin, due to the acid gastric juices. It is

certainly remarkable, sometimes, how often, after the closure of a perforated gastric ulcer, it is known that much turbid fluid is left in the abdominal cavity, and yet the patient makes an uninterrupted recovery. However, it may be, after all, that the peritoneum is able, by its own powers of secretion and absorption, to neutralise all organisms that are not in excess, so that the limited number of those present in the escaped gastric contents are not beyond the power of the peritoneum to overcome and effectually dispose of.

Peritonitis, which follows upon operations within the abdomen, no matter what for, is unfortunately one of the most fatal forms of the disease we encounter. Why it should be so it is difficult to explain, except that the introduction of such micro-organisms as the *staphylococcus pyogenes aureus* or the *streptococcus pyogenes* into a healthy and unprepared peritoneal cavity is more than that lining membrane can withstand.

Symptoms. Unfortunately, it is by no means easy, indeed, in many cases, it is impossible, to say in the early stage that a particular case is one of acute general peritonitis; for it must be recognised that there are stages in the disease.

It has already been pointed out that the virulence and rapidity of an attack depend upon the quantity and quality of the infecting material; so that while the symptoms may be comparatively slow in their progress in one case, they may be extremely rapid and acute in another. But taking the case at the earliest stage when it is possible to be certain that acute general peritonitis exists, we may expect to find fairly distinctive local and constitutional manifestations.

The local signs will be the following: the patient lies in bed in the dorsal position with the knees drawn up to relax the anterior abdominal wall; there will be a general rigidity of the parietes coupled with a feeling of tenderness to palpation all over the abdomen. The respiration will be intercostal, and any attempt to draw a long breath will be checked by a sharp pain felt in the epigastrium and in the sides. The upward pressure of the examining finger, when introduced either into the rectum or the vagina, will cause acute pain. Both these latter signs indicate that the inflammation has extended as high as the diaphragmatic peritoneum and as low as the pelvic peritoneum.

The intestines being paralysed, there will be, in consequence, neither passage of flatus nor of fæces. The temperature may or may not be raised ; but the pulse is usually enfeebled and increased in frequency. There will be loss of appetite, and vomiting may be present. The general appearance of the patient may suggest the gravity of the complaint, but often the facial aspect may be more or less natural.

When, however, a later stage is reached, these symptoms undergo considerable alteration, both locally and constitutionally. The abdomen may no longer be rigid ; indeed, it may convey a kind of dough-like impression to palpation ; pain may be inappreciable. In place of the abdominal parietes being flat and retracted, they may be distended and tympanitic. The face may assume the typical so-called abdominal expression—the facies Hippocratica ; the complexion may have an ashen-grey aspect ; the eyes may be sunken with dark suborbital lines. The tongue may be dry, brown, and furred ; and the vomiting of dark material may be constant. The patient's mental condition may become lethargic, sometimes passing into unconsciousness and delirium. As the end approaches the hands may become livid and cold, and the pulse uncountable. These later symptoms are usually regarded as toxic in character, indicating that the patient is gradually being killed by the absorption into the system of the toxin, the result of the increased development, multiplication, and extension of the bacilli.

Diagnosis. The acute pain, which sometimes heralds an attack of acute general peritonitis, cannot be regarded as anything more than an indication that the peritoneum has been suddenly attacked by a gross lesion. In the light of what further developments reveal, it is confirmatory, and, not infrequently, of differential diagnostic value. But it must be equally remembered that no such acute seizure is a necessary forerunner of the diffuse inflammation which constitutes the typical disease.

In view of the proper treatment to adopt, much importance attaches to the primary cause of the peritonitis ; and once we are sure that the patient is the subject of an acute general peritonitis we should endeavour to ascertain the probable cause. If it is the result of a perforated gastric or duodenal ulcer, we may elicit a history of previous

gastric trouble—that the patient has suffered from attacks of indigestion at various times. Furthermore, while the acute pain of the initial seizure may have been felt in the epigastric or umbilical regions, its maximum seat a little later will be in the upper abdomen, and greater tenderness will be experienced by palpation here than elsewhere.

Rupture or perforation of an inflamed, ulcerated, or gangrenous gall-bladder may also, in the early history, give suggestive prodromata that would indicate that the patient may have been the subject of gall-stones.

Should the appendix be the seat of the primary focus, we may obtain a history of previous pain or discomfort in the right iliac region. It is astonishing how often the appendix is the original focus of the mischief; and how often it is the operation alone that first reveals the fact. This happens more frequently with gangrene of the appendix than with sudden perforation of the viscus. The insidiousness with which a fatal form of acute general peritonitis may progress seems only explicable on the ground that, prior to the general extension of the mischief, the patient has already come under the depressing effects of toxic absorption. Whenever we meet with a case of acute general peritonitis in children, we should always direct our attention specially to the possibility of its being due to appendix trouble. It is by far the commonest cause of the disease with them.

In the case of females, attention should always be given to the possible presence of a vaginal discharge; for where there is nothing to suggest a lesion in the upper abdomen, the presence of such a discharge increases the probability that either a gonococcal, a pyogenic, or a pneumococcal infection exists. The possibility of differentiating these different causes I shall refer to at greater length presently, for recent knowledge, on the exceptional severity and fatality of cases due to pneumococcal infection, demands closer and more detailed attention.

When infection is the result of puerperal conditions, it may take place through the uterine parietes; but the Fallopian tubes are equally likely to be the means of transmission.

When an acute general peritonitis is due to the perforation of some part of the intestinal canal, there may or may

not have been previous indications of bowel trouble. Attacks of obstinate and intractable diarrhœa with mucus, and perhaps blood in the stools, may suggest tuberculous ulceration or ulcerative colitis.

A history of chronic obstruction in elderly patients might indicate the sudden perforation of a cancerous ulcer of the bowel.

Simple, however, as all this may read on paper, it is far from being so in practice ; and frequently we are face to face with a case that we can obtain no light on until we have opened the abdomen ; and, then, perhaps to our amazement, we discover that a fish bone has perforated the intestine ; or that a suppurating and caseating tuberculous mesenteric gland has suddenly ruptured. More puzzling still are those cases where we can discover no cause at all from which the disease has started. It is this extreme difficulty of diagnosing the specific cause that hampers us so much sometimes in knowing the proper treatment to adopt.

Much attention has been directed in recent years to a particular type of acute general peritonitis caused by the pneumococcus. It is an extremely fatal form of the disease, and one which we should, if possible, diagnose. My personal experience is limited to four cases ; although I have doubtless seen several which, for want of knowledge at the time, were probably included under the vague and meaningless synonym of acute idiopathic peritonitis.

I cannot, I think, give a better impression of the disease than by quoting from a paper read before the Clinical Section of the Royal Society of Medicine by Dr. Hector Charles Cameron (*Trans. Roy. Soc. Med.*, 1912, vol. v, p. 123) : " The age and sex of twenty-six cases collected were as follow :

<i>Nineteen females</i>		<i>Seven males</i>	
Age	No.	Age	No.
27 years	1 case	22 years	1 case
20 "	1 "	18 "	1 "
15 "	2 cases	16 "	1 "
14 "	1 case	10 "	1 "
11 "	1 "	4 "	1 "
9 "	1 "	3 "	1 "
8 "	5 cases	2 weeks	1 "
6 "	3 "		
5 "	2 "		
3 "	1 case		
2 "	1 "		

“Fifteen out of nineteen cases in females occurred in girls between the ages of five and fifteen. At such an age the only common forms of peritonitis, besides that due to pneumococcal infection, are peritonitis of appendicular origin and peritonitis due to gonococcal infection. The latter can of course be readily excluded by an examination of the vulva and the vagina. Peritonitis due to infection of urinary or biliary passages, to suppuration in a mesenteric or retroperitoneal gland, to perforation in typhoid fever, or to perforation of a gastric or duodenal ulcer, is so rare that it can be excluded from consideration.

“The differential diagnosis between peritonitis due to appendicitis and peritonitis due to pneumococcal infection depends upon the evidence, in the latter condition, of the presence of a pneumococcal septicæmia. This shows itself in the feeling which we often have when we stand by the side of a case of pneumococcal peritonitis, that the patient is, in general, more ill than can be accounted for by the degree of peritonitis present. Often there is present evidence of infection of other parts, either antecedent or simultaneous. In thirteen of the present cases it was possible to say with certainty that there were other pneumococcal infections, such as pleurisy, pneumonia, or pericarditis, present at the same time. Of these, twelve died. One case, which certainly had lobar pneumonia as well, recovered. Even where there is no evidence of involvement of lung or pleura, the aspect of the patient is sometimes that familiar in lobar pneumonia, with grunting respiration and *alæ nasi* working vigorously. In five cases herpes labialis was present; in others the onset was with rigors, shivering, or convulsions. Where a leucocyte count was done a high leucocytosis was present. In several of the cases it is noted that, comparatively soon after the onset of peritonitis, the signs of free fluid in the peritoneal cavity were present. An early and copious exudation of lymph is characteristic of this form of peritonitis. In Case II opportunity was afforded for timing the rapidity with which fluid accumulates. At the operation there was no free fluid in the peritoneal cavity; after death, thirty hours later, the peritoneal cavity was completely filled with turbid serum. In Cases I and II, which happened to be seen within a few hours of the onset of the peritonitis, the temperature was over 104° F. Such a height of

temperature must be very rare at the onset of appendicitis, or of perforative peritonitis.

"I wish, however, especially to draw attention to the existence, in the last four cases of pneumococcal peritonitis which I have seen, of well-marked follicular ulceration of the colon. In three of these cases—Cases I, II, and III—there was evidence, in the history, of the existence of this colitis for some days, and in one case for three weeks, before the involvement of the peritoneum. In Case II the colitis was seen during life at the operation, at a time when the peritoneum had only just become involved."

It is naturally a matter of no little interest to know how the pneumococcus finds its way into the peritoneal cavity. In two female cases that came under my own observation, the only obvious lesion to be detected in the peritoneal cavity was an acutely congested condition of the fimbriated extremities of the Fallopian tubes. This was also noted as the only lesion found in a postmortem made by Dr. John Anderson, of the Victoria Infirmary, in another case which he examined. In his observations on this case, he drew attention to the fact that the attack of acute peritonitis had supervened on the completion of the menstrual period; and raised the interesting question as to whether the "chills" sometimes complained of at this time might not be due to an infection, pneumococcal or otherwise.

As regards the mode of infection in male cases, the fact, to which Dr. Cameron draws attention, of the presence in four of his cases of "well-marked follicular ulceration of the colon," possibly throws some light on the subject. It is quite within the bounds of possibility that the damage, which the peritoneum covering the inflamed and ulcerated bowel suffers, may so inhibit its protective and preventive properties that the pneumococcus is able to make its way through the injured visceral parietes into the cavity, and so set up generalised acute peritonitis.

One of the four cases which I have observed and treated is of interest mainly from the fact that the patient recovered. It is worthy, I think, of being referred to in detail.

Lizzie H., aged ten years, was sent into the Victoria Infirmary on the evening of June 6, as a case of acute appendicitis. In the note accompanying her admission, the doctor stated that on the evening of June 4 she was

seized with severe abdominal pain, chilliness, vomiting, and purging. Her temperature was 104° F., her pulse about 150. The pain was generalised over the abdomen, but was most severe over the appendix region. The parietes were tense; there were no indications of pulmonary symptoms.

On the following day, the temperature was normal and the pulse-rate 120. Pain was felt most over the appendix region where the parietes were tense; vomiting and diarrhoea had ceased. The child had enjoyed good health prior to the onset of her illness.

When admitted to the infirmary she did not look very ill. She stated that her pain began in the epigastric region, but that it subsequently settled in the appendix region. Her tongue was coated with whitish fur; temperature, 99.8° F.; pulse, 104. The heart and lungs appeared normal; urine, sp. gr. 1030. The abdomen when examined was found to be rather tumid. There was no marked rigidity of the muscles; and, on palpation, tenderness was felt in both iliac regions, more marked in the left. The percussion note was clear all over. The abdomen was opened by the usual "gridiron" incision in the right iliac region. There was some acute injection of the intestinal parietes, but there was nothing in the appearance of the appendix to suggest that the trouble arose from disease of it. There was a fair quantity of turbid, non-smelling fluid in the peritoneal cavity; this was swabbed away as much as possible, and some of it sent to the bacteriologist for report. The appendix was removed, but did not, on being split up, present any pathological lesion. The abdomen was completely closed.

The following day the temperature went up to 101.4° F., rising on the four succeeding days to between 103° F. and 104° F. On the second day after the operation there were evidences of consolidation at the base of the right lung. On the sixth day after the operation there was a sudden fall of the temperature to 99° F. About this time the nurse in charge noted that there was a whitish discharge coming from the vagina. (Unfortunately none of this discharge, which apparently was only observed on one occasion, was submitted to bacteriological examination.) A rise of temperature again took place, there being a difference of

two and three degrees between the evening and morning temperatures. Dr. McKinnon, my resident assistant, then discovered that there was an empyema on the right side, as was proved by the introduction of an exploratory needle. The pleural cavity was therefore opened, and a quantity of pus evacuated. From this date onwards the patient's temperature remained normal and her progress to recovery uninterrupted.

The purulent material from both the peritoneal and the pleural cavities was reported by the bacteriologist to contain the pneumococcus.

The case, I think, must be regarded as an illustration of a mild pneumococcal infection ; and that while the disease is generally fatal, we may, as in this case, occasionally meet with instances that will pursue a course to recovery. It is doubtful whether the opening of the peritoneal cavity served any beneficial purpose ; indeed, it would rather appear as if it might have had some adverse influence, for the temperature rose on the next day, and lung symptoms at once became evident. It is to be regretted that a bacteriological examination was not made of the discharge from the vagina. For, had the pneumococcus been found in this, it would have gone far to support the theory, already stated, that many of these cases owe their origin to infection through the Fallopian tubes.

Treatment. Whether to operate or not to operate is always the first question we have to consider. Until we are better able to diagnose the cause in each case, we are practically limited to deciding whether we think the patient will stand the additional shock attendant on the administration of the anæsthetic and the execution of the operation ; or whether such an extra strain on the heart and nervous system will most likely prove fatal. A patient that has a running, uncountable pulse, livid and cold hands, a listless look, and a mental lethargy that makes him indifferent almost to everything that surrounds him, is obviously moribund ; and, therefore, quite unsuitable for operation. But anything short of this, the surgeon must exercise his own individual judgment in the matter ; for the personal equation counts for much in dealing operatively with these cases ; and that directly in proportion to the advanced stage of the disease. Dexterity and rapidity in operating

are essential ; and these again can only be exercised when the conditions are such that assistance and conveniences are at hand. Considerations of this kind make all the difference in the success or failure which is likely to attend operations upon an advanced case. Thus, then, it is impossible to lay down any definite rule regarding the stage of the disease at which laparotomy should or should not be performed—except when the patient is obviously *in extremis*, when no one would or should venture to open the abdomen.

It is usual to assume that the cause of death in these patients is toxæmia ; and for this reason, therefore, much of the treatment is directed to check its further progress both by the removal of the foci from which the toxins proceed and the lessening of the effects of such toxins as have already gained access to the circulation. Operation can alone effect the one ; but conservative measures may aid in lessening the other.

As a preparatory measure to operating, the stomach should be washed out ; and more particularly should this be done if there is any approach to anything that appears like fæcal vomiting.

While there are those who would, in certain advanced cases, advise operation under local anæsthesia, it is doubtful whether the probable shock which such incomplete anæsthesia must almost necessarily entail, would not be more deleterious in its effects than a carefully administered general narcosis. Personally, I prefer the freedom which a general anæsthesia permits ; and if ether be given, and not chloroform, the heart's action is not so likely to be depressed.

If it has been possible to make a fairly certain diagnosis of the original focus of the disease, the parietal incision should be made accordingly ; that is to say, the incision should be made in the mid-epigastric region for a perforated gastric or duodenal ulcer ; if for the appendix, in the right iliac region ; and if for some pelvic lesion, in the mid-hypogastric. These incisions should be fairly extensive, and made without loss of time directly into the peritoneal cavity ; bleeding vessels should be clamped for the time being. Purulent fluid of some kind is likely to escape at once ; and in cases of perforated gastric or duodenal ulcer this is likely to be preceded by some gas. A little of the

exudate should be collected in a sterilised test-tube for subsequent investigation. The lesion should then be sought for and dealt with accordingly—a perforation closed, an appendix or a Fallopian tube removed, &c.

In some cases this part of the process is impossible on account of the greatly distended coils of intestine which at once present and blot out of vision all deeper structures. Should this be the case it is necessary to puncture or incise the bowel in one or more places, and let out as much as possible of the churned-up, fœtid gas and fæces. Hopeless as such conditions generally are in these particular cases, success may attend our efforts; and no remedial measures should be neglected.

Although at the expense of some repetition, I repeat here, what I have advised elsewhere under somewhat similar conditions, the method which has, in more than one instance, been followed with good result. As much protection as possible is given to the exventrated coils of distended intestine by keeping them covered with sterilised dry gauze compresses. The loop to be incised is held by an assistant who so manipulates it that the contents of the intestine flow into a receptacle freely and without fear of contaminating the surrounding parts.

The paralysed condition of the intestinal walls, usually present in all advanced cases, renders peristalsis impossible, so that it is necessary to employ mechanical measures to rid the gut of its toxic contents. This the operator effects by “milking” the bowel proximal to the incision, the assistant gently pinching the bowel distally so that the contents must make their exit at the opening. This may prove sufficient to relieve the distension, and admit of further intro-abdominal inspection being carried out. If it does not do so the process must be repeated at another point in the distended gut. It has been advised by some that a considerable length of the intestine should be flushed with saline solution by making a puncture high up and an incision low down. I have never tried the method, and would doubt somewhat its value and advisability in the particular class of cases under discussion. Its applicability is more for those cases where a mechanical obstruction exists, and the bowel is paralysed more from over-distension than from inflammation.

It is my custom, before closing the incision in the bowel wall, to introduce an ounce of sulphate of magnesia dissolved in about six ounces of warm water, with the object of obtaining, as soon as possible, an evacuation by exciting peristalsis. When we have thus dealt with the coils and sufficiently reduced their distension, they are freely flushed with warm saline solution and returned to the abdomen. It is needless to say that the whole of this preliminary process must be carried out as expeditiously and as gently as possible.

A search is now made for the lesion, and this is dealt with in the manner required; but bearing in mind the serious complication which exists—the general peritonitis—the measures must be the simplest that can be employed consistent with safety and security. To repeat more in detail, what I have above briefly indicated, a perforated gastric or duodenal ulcer should be closed by a “purse-string” suture, coupled with additional over-folding if there is doubt as to the security of the single surrounding stitch. The possible requirement of a gastro-jejunostomy should be left for a future operation; our main efforts, for the time being, are alone centred in tiding the patient over the acute general peritonitis.

The appendix may be removed, if it can be so conveniently; our endeavour is to shorten the operation as much as possible; and a prolonged effort to deal efficiently with the viscus would result in more harm than if we had remained satisfied with drainage and gauze packing. The same remarks apply to the treatment of the Fallopian tubes.

Rutherford Morison (*British Medical Journal*, 1911, vol. ii, p. 1069) speaks highly of the value of saline solution coupled with adrenalin in bad cases. He states: “In patients who are very ill *an intravenous infusion of normal saline solution* and a small dose of adrenalin at a temperature of 100° F. slowly administered during the course of the operation, is invaluable. The total amount should rarely exceed two pints, and not less than fifteen minutes should be occupied over the introduction of each pint.” Koch (Gröningen) also speaks of the value of this treatment, and supports Heidenhaim’s view of the value of adrenalin (*B.M.J.*, *vide supra*). When we have dealt with the focus of infection—

that is, supposing we have found one—our next attention is directed to the removal of the sero-purulent effusion which occupies the peritoneal cavity.

I suppose no part of the whole operation has led to more controversy and differences of opinion than that which concerns the best course to pursue with regard to whether the effusion should be removed ; and, more particularly, how it should be removed. One point is quite clear and certain, and that is, that every advocate of any particular method claims success as the result of the employment of such method. I do not, therefore, think it is possible to speak with special commendation of one method over another ; for there is probably much to be said for any and every method that is carried out with due attention to every detail connected with its execution. Where failures result and contrary opinions are expressed, it is frequently found that there are defects in the details of performance which render adverse consequences only too likely.

There are certain very salient features to consider in dealing with the question. First, we have practically a great, closed, irregular cavity in which a collection of fluid has no means of escape, and can only possibly be removed by the natural physiological process of absorption. Gravitation plays no mean part in the disposition of the fluid ; thus, it will collect in the pelvic cavity principally ; and, with the patient in the dorsal recumbent position, it will lodge in the lumbar regions, and more particularly on the right side.

Secondly, the large quantity of fluid which the peritoneum itself secretes in all probability indicates that this is one of Nature's measures to counteract the influences exercised by the bacterial invasion. We are, therefore, in one sense placed somewhat on the horns of a dilemma. For, by removing the fluid, we may lessen the neutralising and recuperative powers which Nature is exercising ; and yet, by leaving the same, we may have failed to give that assistance by diminishing its quantity and weakening its quality which would have enabled the peritoneum to succeed in its efforts to heal.

It will be at once seen how such considerations are liable to affect the result of any particular method of treat-

ment ; how success may follow in one case and failure result in another, although, so far as can be judged, precisely a similar plan of operating has been carried out in each instance.

It has always appeared to me that every case must be considered solely on its own merits, a particularly trite and commonplace enough statement, and yet one peculiarly applicable to the special class of cases now under discussion.

The two most important factors in any case are the nature of the infecting agent and the quantity of the purulent fluid present. In the case, for instance, of a perforated gastric or duodenal ulcer—and it must be remembered that I am dealing with the added complication of general peritonitis—we may find a considerable quantity of scentless, turbid material in the pelvic cavity, and in the right lumbar region. The bacterial invasion is usually neither large in quantity nor virulent in quality ; all, therefore, that it is necessary to do is to remove the excess of the exudate by an incision in the loin, and another in the mid-hypogastric region ; rubber or glass drainage tubes are inserted and retained for about forty-eight hours. As regards the method of removal of this fluid, I prefer to use dry sterilised gauze swabs gently inserted and removed. Some who fear any frictional effect of the gauze upon the peritoneal surfaces attempt to remove the fluid by suction through a tube.

If the focus of infection be a gangrenous or perforated appendix, a ruptured pyosalpinx, or the result of some other powerfully infective lesion, a large quantity of highly offensive and extremely toxic fluid may occupy the pelvic cavity. It not infrequently happens, also, that in these cases the purulent fluid in the general peritoneal cavity itself is scentless, and devoid of the characters possessed by the collection in the pelvis. When this difference exists, care should be taken to disturb the one as little as possible, while dealing with the other as radically as we can ; and by this I mean, not only should we swab away the pelvic fluid as above directed, but we should flush freely with some saline solution. In carrying this out, the patient should be in the inclined position ; and the flushing should be executed in such a way that, as the fluid is introduced without any pressure, it can as freely and easily

make its exit ; there is then no chance of the pelvic fluid being forced into any other part of the abdominal cavity. Free drainage should also be maintained by a tube passed down to the floor of the pelvis through a median hypogastric incision which it has probably been necessary to make in addition to any other that may have been made previously. No attempt should, I think, be made to deal with the general peritoneal cavity itself. It is quite probable that having removed the focus and taken away the excess of infecting material, the peritoneum will be able to deal with what remains.

The use of iodoform gauze packing I am inclined to limit only to such cases where it seems advisable to shut off the possibility of any further infection from a definite focus. Thus, the appendical region, or the pelvic viscera of the female, when it is not certain that we have been able to exclude any further infection from these parts, should be so treated. In the case, too, of a ruptured gastric or duodenal ulcer, it is wise to conduct a strip of gauze down to the lesion if we are in doubt as to the permanent security of the sutures, or their effectiveness in occluding the perforation.

When on opening the abdomen we discover a diffuse general peritonitis without much sign of purulent fluid being present, and without any very definite focus of infection, it is doubtful whether we should attempt to do anything more. Many cases of the pneumococcal type come under this category ; and so far have proved practically unamenable to surgical treatment.

As regards the treatment of post-operative peritonitis, I believe it to be perfectly useless to reopen the abdomen. Whatever may be the source of the infection in these cases—whether introduced from without or the result of defective suturing—it seems to take such a hold upon the peritoneum that any further measures are likely enough to aggravate rather than relieve or improve the condition.

On removal of the patient from the operating-room or theatre to the bed, care should be taken to keep the upper part of the body slightly raised ; and this position should be maintained and gradually increased when the patient is placed on his back. The object aimed at is to cause all the infecting peritoneal fluid to gravitate to the pelvis. Here absorption is much slower than in the upper part of

the abdomen ; and so the circulation obtains more time, through the receipt of a diminished quantity, to rid itself of its toxic contents. And, further, a large collection of pus in the pelvic cavity is a far less serious matter than a similar accumulation in the upper abdomen, where, as a subphrenic abscess, it may prove a serious subsequent complication should the patient recover from the general peritonitis.

As regards the after-treatment of these cases, much importance is now attached to the continuous employment of rectal injections of salines. Murphy of Chicago, to whose initiation we are indebted for this method, devised a means of continuous administration. Many modifications exist ; but its execution can be quite well carried out with an ordinary urethral rubber catheter connected up by a flexible rubber tube to a glass filler or funnel. A good nurse will administer, with but very little discomfort to the patient, half a pint or so of the solution at intervals of two or three hours, limiting the quantity and varying the times according to circumstances. The object of this method of proctoclysis, as it is termed, is to excite a free renal secretion, and so carry off, as soon as possible and as much as possible, the toxins which have been taken into the blood.

Professor Koch of Gröningen, in the discussion on the subject of "General Septic Peritonitis" already referred to, speaks of the value of performing an appendicostomy at the time of operating ; for by using the appendix in this way it affords the opportunity of giving salines to the patient during the first days after operation. The suggestion certainly seems a good one, if, in the first place, the appendix be not itself the offender ; and, in the second, the little additional time required for the operation appear feasible. Its convenience in every way, as contrasted with proctoclysis, must be considerable.

Professor Koch is also responsible, at the same discussion, for giving expression to another good practicable suggestion regarding the treatment of post-operative vomiting often so trying to the patient in this disease. He observed : "After the operation one of the most cruel symptoms we have to treat is persistent vomiting. I think this is best treated by the continuous drainage of the stomach, a thin

drainage tube being introduced through the nose, as is recommended by my friend and countryman, Westerman. This treatment is much more efficacious and less fatiguing than the repeated washing out of the stomach."

As regards the use of drugs before, during, and after operation, much difference of opinion exists, especially in respect to the employment of morphia and aperients. If morphia has any inhibitory effect upon renal secretion or any other excretory organ, and I take it that it has, then, I think, except when given in the smallest possible doses to relieve pain, its use should be avoided. My experience, however, is that as regards pain in these particular cases morphia, even in large doses, will not relieve it; nor do I know anything that will; as the toxæmia increases so the pain subsides.

Aperients, whether in the form of castor oil, calomel, magnesium sulphate, &c., are mostly useless; for, as already stated, an inflamed bowel is a paralysed bowel, and no amount of stimulation, brought about by the administration of aperients, will evoke peristalsis. They will often only increase the vomiting.

When, however, signs of recovery set in, there is no doubt as to the advisability of getting the bowels to move as soon as possible. For this purpose I prefer frequent small doses of magnesium sulphate.

In order to further excite peristalsis it has been advised by some to give pituitary extract.

With failing circulation, Morison speaks of the value of one drachm of tincture of digitalis added to the first pint of rectal injection.

The future may hold out for us some assistance in the use of vaccines in these cases. If we can assist the resisting powers of the system generally, and help the natural forces of the body to neutralise the toxins absorbed, there may be hope for certain cases that, at present, we do little good for by operating. We want, of course, in the first place, to be more certain of our diagnosis: to know whether the infection is pneumococcal, streptococcal, or dependent on the bacillus coli communis or any other micro-organism. In the second place, we want to have the proper vaccine ready for use, for these acute cases must be treated without delay. We cannot wait three or four days for an autogenous

vaccine to be prepared ; for by that time most of these cases will be beyond all treatment.

In the case of pneumococcal peritonitis, which is the form of the disease that, almost without exception, defies all surgical intervention, our only hope lies in what we may be able to do along such lines as those proposed. The rapidly fatal nature of these cases renders the use of stock vaccines imperative. For this purpose, therefore, a vaccine should be made from some previous case of pneumococcal peritonitis. That we may hope for some success in this way seems warranted from the good results which Nathan Raw claims to have seen follow the employment of a stock pneumococcal vaccine in cases of pneumonia (*Lancet*, 1912, vol. i, p. 646).

CHAPTER XIX

REMARKS ON CHOLELITHIASIS

THERE is no lack of problems which remain unsolved in connection with the subject of gall-stones. While, in recent years, surgery has done much to deal successfully with the disease, and our knowledge of it, in many of its clinical aspects, has very considerably increased, we are still in the dark in regard to many questions connected with the etiology of the disease, and with the various courses it may pursue. There are, also, many varied opinions held with respect to the subject of treatment.

It is with a few of these problems and practices that the following remarks are intended especially to deal. That which books have been written upon, it need hardly be indicated, a solitary chapter can but imperfectly and inadequately discuss ; so that it must be clearly understood that not the slightest attempt is made to treat the general subject of Cholelithiasis systematically, or in a way that can be expected to fully enlighten the totally uninitiated upon the subject.

Pathology and Etiology. I suppose it might be said that if there were no gall-bladder, there would be very few

cases of gall-stone disease ; in other words, that gall-stones would not form if there was no gall-bladder for them to form in. But such a very definite structure must have a very distinct function to perform ; and, like so many other viscera, would continue to do its duty untainted by disease if it were not for the occasional interference it suffers from accidents associated with the more or less artificial exigencies of life.

These simple anatomical and physiological facts are known to us : first, that the liver is essentially an excretory organ ; and second, that the bile which it secretes carries with it various products but for whose elimination or excretion the system as a whole would suffer.

The amount of bile secreted in twenty-four hours is computed at about thirty-five ounces. After the ingestion of food the secretion is increased, and the bile pours directly down the hepatic and common ducts into the duodenum, mixes there with the intestinal contents and effects its special physiological and chemical purposes. When the stimulus connected with the ingestion of food passes off, the quantity of bile is greatly reduced ; and then instead of, as before, pouring straight into the bowel, it is conducted by the cystic duct into the gall-bladder to await the requisite stimulus for its re-entrance into the common duct. Why this storage of only about an ounce and a half of bile—the normal capacity of the gall-bladder—should take place, it is somewhat difficult to understand, except that it lies there ready at the first call to pour its contents into the bowel before a free and sufficient secretion can be obtained from the liver. It is probably one of those nice adjustments, which Pawlow's experiments have shown, Nature so beautifully exercises in carrying out her wonderful scheme of digestion and nutrition.

There is a peculiar anatomical fact about the gall-bladder and its duct, and it is this, that the neck of the former has a well-marked sigmoid curve about it, and a small valve at its junction with the cystic duct. It is probable that the pressure of the bile within the ducts is very slight, and particularly so when secretion is at its lowest ; however, the access of the bile to the gall-bladder must be easy and unimpeded ; but, for its discharge, it requires the muscular contraction of the gall-bladder

parietes to drive it out. The presence of the sigmoid curve and the existence of a valve indicate how little, possibly, may be required, in the way of intrinsic and extrinsic causes, to create positive obstruction to the out-flow of bile within the viscus.

Now, it seems only too probable that in the large proportion of gall-stone cases one of the principal causes of the formation of stone is to be found in the existence of obstruction at the neck of the gall-bladder, and more particularly in the sigmoid curve. Indeed, we have in the case of the gall-bladder a precisely similar condition of things to that which exists in the case of the vermiform appendix, where, it will be remembered, nearly all the lesions, including the formation of coproliths or stercoliths, could be explained on the basis of obstruction to the exit of such media as may have gained entrance to the organ. The parallel in these two conditions could be carried still further ; for, just as in the case of the appendix it is the entrance of micro-organisms that seems to directly excite the mischief, so with the gall-bladder. There is, however, this distinction between the two, that in the latter the entrance of micro-organisms may not be accidental, but part of a normal functional process ; for these bodies are being carried there by the bile which is the medium by which it is possible they are intended to be discharged from the body.

While, as already stated, it seems likely that retention in the gall-bladder is mainly effected through mechanical causes associated with the neck of the viscus and the cystic duct, it must be remembered that there is another possible seat of obstruction at the outlet of the common duct in the duodenum. At this point there is a distinct narrowing of the canal, the actual entrance into the bowel being guarded by the choledocho-duodenal sphincter. Under normal conditions this sphincter relaxes immediately the food enters the duodenum from the stomach ; at which time, also, the bile begins to flow freely through the common duct.

It is quite reasonable to assume that, as in other parts of the body, this orifice may vary both in its anatomical dimensions and in its physiological action. In some subjects it may be unduly small ; and, therefore, if, added to this,

there be any slight increase in the consistency of the bile, the ready access of this fluid into the intestine may be impeded, with the result that an inhibitory check is thrown back upon the gall-bladder so that it, in turn, is handicapped in the discharge of its contents. And, again, all sphincters are liable to spasmodic contraction ; and, therefore, if from any cause, directly, through the state of the bile itself or the conditions of the duodenal contents ; or, indirectly, through the nervous system, the sphincter should fail to relax at such times as it normally should, retention of the bile within the gall-bladder will naturally be favoured.

These may be merely theoretical and speculative considerations ; but, still, when considered in relation with what we know of other sphincter-guarded orifices, they cannot be wholly regarded as unreasonable, and may prove explanatory of certain cases which, from the absence of better known causes, we are otherwise unable to understand.

Under ordinary circumstances the bile is always retained, for a longer or shorter time, in the gall-bladder ; so that should infective micro-organisms be present, they have an opportunity of effecting their deleterious influences. It need hardly be indicated how greatly augmented must be the chances of their mal-influences being exercised, if the period of their retention within the cavity of the gall-bladder is increased by any cause such as obstruction in some part of the canal passage between the viscus and the duodenum.

Another cause, also, must not be lost sight of ; and one, too, to which considerable weight is attached by some, that is, the consistence of the bile itself. When, from any cause, this is abnormally thick or viscid, its retention in the gall-bladder may be the more readily increased by any of the obstructive causes above indicated. Hence it will be understood how the probability of bacterial influences being effected is likely to be considerably augmented.

The importance which it will, by this time, have been gathered micro-organisms play in the production of cholelithiasis and its many sequelæ, leads to the three-fold question : What are these organisms ? From whence do they come ? What do they do ?

In answer to the first question, the microbes principally concerned are the *bacillus coli communis*, the pneumo-

coccus, the streptococcus pyogenes, the staphylococcus pyogenes aureus, and the bacillus typhosus.

In answer to the second question, the microbes find their entrance into the bile and into the gall-bladder by three different routes. Probably, least frequently, they reach their destination by way of the systemic circulation ; less frequently, directly up the common duct from the duodenum ; but most commonly, by what may be regarded as the natural route, the excretion of the liver. In other words, the micro-organisms get into the portal circulation being carried by the venous blood to the hepatic cells, where they are passed on into the bile. Thus, for instance, it is in this way that the typhoid bacillus and the common colon bacillus gain access to the bile, and so to the gall-bladder.

In answer to the third question, it has been unmistakably proved that the nucleus of a gall-stone is very frequently micro-organisms of one or other of the types above mentioned ; and that the main constituents of such so-called mixed stones are cholesterine and calcium. The sequence of events seems to be the following. The first deleterious effect of the presence of micro-organisms is to irritate the mucous membrane of the gall-bladder ; this leads to the shedding of epithelium and the supposed deposit of crystals of cholesterine. The micro-organisms and the epithelium form a foundation for the accretion of cholesterine and lime salts. But the mucous which the lining membrane of the gall-bladder secretes, and the colouring-matters contained in the bile, together assist in the process of agglutination ; and so we get stones of varied consistency, construction, and colour.

It may be stated that there is some difference of opinion with regard to the source of the cholesterine, whether it is derived from the epithelium or from the bile. That we may have pure cholesterine stones presenting a very typical radiating structure quite independent of any apparent inflammatory irritation of the mucous membrane and, therefore, of the shedding of epithelial cells, seems strongly to favour their origin as the result of a simple uncomplicated biliary deposit. When inflammation is present, it shows its effect upon the stones by causing an accretion of calcareous matter.

As regards the shape, size, and number of stones that may be met with, I shall say nothing ; but merely state, as indicating the great diversity which exists, that no two cases are ever precisely alike in these varied respects. We may, on simple mechanical grounds, explain why some stones are faceted, some smooth, some rough, &c. ; but we do not know what determines at the outset why only a single stone should be formed in one case and several in another. We may, however, place this interpretation upon certain stones, that when we find a solitary stone which shows on section that it is composed of pure cholesterine we may conclude that its origin was independent of any bacillary influence ; that, indeed, it is unaccompanied with and has never been associated with any inflammatory process. On the other hand, mixed stones, those showing cholesterine in association with calcareous material, may be considered as having been, either at the outset or at some time subsequently, involved in inflammatory complications.

It is not difficult to track the micro-organisms in their path of progress ; and to understand how they may be fruitful in the production of other pathological changes. Suppuration, ulceration, and necrosis may all prove sequels to their deleterious advance.

The part played by any obstruction to the outflow of the contents of the gall-bladder has already been briefly referred to ; but I may add a few more remarks in detail.

While the micro-organisms thus produce changes in the gall-bladder, they may also do so in the ducts. If, therefore, nothing more than a catarrh of the sigmoid curve of the neck of the gall-bladder, or of the cystic duct be evoked, this may lead either to a temporary or to a permanent obstruction of the canal. It will be temporary if the consequent swelling of the mucous membrane subside and leave the canal normally permeable ; or it will be permanent if the inflammation has passed through the walls of the duct passages and led to the formation of adhesions. These latter may prove obstructive in themselves, or they may cause such an amount of kinking, directly or indirectly, that no sufficient patency of the canal exists. Obstruction from inflammation may take place at any period of life, for there is no period at which micro-organisms may not be present in the bile ; and while stones are most

frequently found after the fourth decade of life, they are often met with much earlier, and have been discovered in the newly born.

It is quite possible that a congenital narrowness of the neck of the gall-bladder or of the cystic duct, or even too great a development of the valve, may be the cause of obstruction in some of the cases occurring in early life, not to speak of similar conditions possibly existing at the choledcho-duodenal orifice. I have encountered two cases which seemed to me illustrative of some such malformation at the neck of the gall-bladder. For the nature of the constriction did not appear explicable on the ground of inflammation ; nor had it at all the semblance of being an acquired defect. It is worth while, I think, describing one of these cases in full ; for the history given, as well as the age and condition of the patient, tends to support the suggestiveness of the probable nature of the lesion.

Doris C., aged sixteen years, was sent into the Victoria Infirmary supposed to be suffering from gastric ulcer. When thirteen years old, she was first seized with acute pain just below the xiphoid cartilage, which caused her to vomit. Previous to this, she had been in excellent health. The pain, she stated, began directly after food, was acute and stabbing in character ; and lasted for about an hour, when it was replaced by a dull gnawing pain. In the first year she had several similar attacks ; and during the succeeding two years they became much more frequent and more severe. The pain had more recently somewhat extended. It still commenced, immediately after food, under the xiphoid, but often spread down to the umbilicus, and radiated through to the back. Food always exaggerated and never relieved the pain. It would sometimes waken her during the night, and prevent sleep. She had not been troubled by flatulence, nor by acid eructations. At times she was constipated.

Physical examination of the abdomen was entirely negative. She was a well-built, well-nourished, and altogether an extremely fresh-coloured, healthy-looking girl ; so healthy in appearance, indeed, that doubt was entertained, at first, as to the validity of her symptoms, and the existence of any possible organic mischief. During her residence in hospital she had two or three attacks of

pain ; but her particularly merry way of telling of the attacks led us to regard them somewhat lightly ; and certainly we were not inclined to accept her statement that they were severe. She seemed, however, sensible in her insistence that she could not return to her work unless something were done for her ; and her friends, too, added their support to the girl's own statement, that she was often prevented from doing her work on account of the attacks of pain. No other symptoms of any kind were elicited.

An exploratory operation was performed, when the following conditions were found. The gall-bladder was markedly distended ; and, when tapped, was found to contain a quantity of clear, viscid material. Although nothing definite could be felt externally, it was considered evident that obstruction existed somewhere at the neck of the gall-bladder. The viscus was, therefore, excised. On examining it, a small stone, a little larger than a pea, was found encysted at the neck. It was somewhat roughened on its exterior, very pale yellow in colour, and composed of pure cholesterine. The opening leading from the cavity of encystment into the cystic duct was, in calibre, about the diameter of an ordinary hair-pin. There were no adhesions or thickening to suggest previous inflammation of the part. The inference drawn was that there had been a congenital constriction or narrowing at the commencement of the cystic duct.

Extending still further our considerations on the formation of gall-stones in the gall-bladder through the agency of micro-organisms, it is not difficult to understand how the ducts themselves may become the seats for the formation of stones, for the influences of the organisms on the mucous membrane may be precisely similar ; and not only so, but like changes leading to obstructive effects may ensue. It is certainly rare for stones to form in the intra-hepatic, the hepatic, and common ducts ; and when we do meet with them in one or other of the latter situations, it is much more likely that they have wandered or been driven there from the gall-bladder than that they have taken their origin *in situ*.

While ascribing so many of the primary conditions present in cholelithiasis to the direct action of micro-organisms, it must be remembered that when once a stone is formed,

it may become itself a source both of irritation and of obstruction. Indeed, the various symptoms which subsequently develop are attributes, almost exclusively in many cases, of changes evoked by the presence of stones. Thus, the jaundice which occasionally accompanies the disease may be due either to catarrh of the hepatic duct or of the common bile duct set up by the mechanical irritation of the stone or stones, or to an actual block of the common canal.

Again, the pain, which is such a characteristic manifestation of the complaint, is invariably the result of an effort on the part of the gall-bladder or ducts to get rid of the foreign body.

Then, further, when a stone blocks completely and permanently any part of the bile passages it causes a damming back of the secretion. If the block occurs at the neck of the gall-bladder or in the cystic duct, the gall-bladder itself becomes distended with its own secretion, that is mucus; while should such a blockage take place in the common duct—and when it does so, it is mostly in or close to the ampulla of Vater—then the bile is forced back, and distends the gall-bladder and the ducts. As a clinical fact, however, it is much more usual for calculus blocks in the common duct to be of an intermittent character; for the distension of the duct which takes place above the obstruction loosens the stone, and allows the passage of the bile past it; so that for a time the obstruction is relieved, and the jaundice subsides.

There are several other interesting questions of an essentially practical nature connected with gall-stones; and these mostly centre on the one major question of—What is their future history? The chief importance of the answer to this question lies in the bearing it has on the subject of treatment. Taking the commonest situation in which a gall-stone may be formed, that is, in the gall-bladder, one of five possibilities may mark its future career:

- (1) It may remain quiescent throughout life.
- (2) It may remain, but prove the source of local and constitutional disturbances.
- (3) It may pass *per vias naturales* and be discharged *per anum*.

(4) It may make a new way of exit for itself.

(5) It may, after leaving the gall-bladder by either of the exits (3) and (4), be the source of obstructive trouble, and other complications elsewhere.

That stones may remain quiescent is amply testified to by their discovery, postmortem, in patients who have died without ever evincing, during life, symptoms of their existence. As a rule these stones are of the pure, cholesterine type.

That stones are the direct cause of various local and general complications is equally amply testified to by the performance of operations for the relief of symptoms to which they have given rise. It is probable that in cases of this class, while the mechanical irritation of the stone may be the indirect cause of the pathological changes, the real, exciting cause is the presence of micro-organisms which find a focus for development and infection in the physical damage done by the stone. By far the largest number of cases with which we have to deal fall under this category. All the varied results of inflammation may ensue. The gall-bladder may be filled with purulent fluid; the wall of the viscus may become infiltrated; and according to the acuteness or chronicity of the process so will be the nature of the resulting lesion. Extension of the inflammation to the outer surface of the gall-bladder may again lead to a varied series of changes. The localised peritonitis set up will lead to the formation of adhesions; and these may bind together any of the neighbouring parts. But the peritonitis may be of a more serious infective type leading to suppuration and the formation of an abscess in the liver and elsewhere. The bursting, also, of this purulent collection into the peritoneal cavity will cause an acute general septic peritonitis. Such a serious consequence as gangrene of the gall-bladder is probably dependent both upon the action of the inflammatory process, and more particularly upon the virulent character of the infecting micro-organisms. Apart, however, from all inflammatory consequences, there is the known possibility that the constant, apparently quiescent irritation of a gall-stone may end in the production of carcinoma.

That stones may make their way out of the body by the normal passages is sufficiently attested to by the fact

that they are sometimes found in the fæces following upon an acute attack of gall-stone colic.

That gall-stones sometimes make an artificial route for their escape is proved by the exceptional size to which they attain, rendering their passage from the gall-bladder by way of the cystic and common bile ducts a practical impossibility. But more certain evidence is forthcoming when we find a fistulous opening, or indications of the previous existence of such, between the gall-bladder and the duodenum or the large intestine.

But, although stones may make their exit from the gall-bladder by normal or adventitious routes, and without any immediate or remote consequences of gravity to the region itself, they are still capable of causing trouble before reaching the rectum. At any part of the intestinal canal, although most commonly in the lower part of the small intestine, they may become impacted, and cause obstruction. A rare seat for impaction is the vermiform appendix ; and as one such case came under my own observation and treatment, I think it is worthy of being recorded in full.

The patient was a postman, aged twenty-six years. He was admitted to the infirmary for presumed gall-stone disease. Up to two years prior to his admission, he enjoyed good health ; but at this time he was seized with a severe attack of pain over the stomach which "doubled him up." He vomited and became slightly jaundiced. The pain lasted a few days ; the whole attack passed off in about ten days. He remained well for about eighteen months ; when he was seized with a second attack, with pain in the epigastrium, accompanied with sickness and vomiting. About an hour and a half after the seizure the pain became localised in the region of the gall-bladder. This attack only lasted for about a day, and then passed off. He remained well for a few months, until a third attack came on. The symptoms were exactly similar, except that on this occasion he became deeply jaundiced, his urine dark in colour, and his stools typically clay-coloured. This attack lasted for about a month ; but since then he had had repeated minor attacks. On admission, no physical signs were elicited except a slight resistance over the right hypochondrium.

The abdomen was opened by the right medio-oblique

subcostal incision. Adhesions were at once encountered passing from the free margin of the liver downwards. After a certain amount of separation of loose attachments, a particularly firm adhesion was encountered between the bowel and the under surface of the liver. While separating this, a small calculus about the size of a pea escaped. As the parts were still further separated, it was found that the opening from which the calculus had come was the junction of the appendix with the cæcum. The appendix was lying up under the liver to which it was adherent. It was removed in the usual way, and the opening into the cæcum closed. A further search through the adhesions revealed the gall-bladder, undistended, and apparently free from calculi. As the stomach and duodenum seemed so much dilated, still more separation of adhesions was effected, until it was found that the passage from the stomach into the duodenum and onwards was quite free. The finger passed into the foramen of Winslow could detect nothing in the ducts. A counter-opening was made in the right loin to drain the hepatic pouch. The parietal wound was completely closed. The pathologist reported that the calculus was a cholesterine gall-stone.

If, as seems almost certainly must have been the case, this small stone had passed by the normal passages to the cæcum, and then, becoming impacted at the commencement of the appendical canal, had ulcerated its way through, it is a strange coincidence that the appendix itself should have been located, where it was, close to the gall-bladder.

Symptoms and Diagnosis. It is somewhat of a problem to understand why, when once gall-stones have formed within the gall-bladder, they do not, then and there, cause symptoms. They are, for all intents and purposes, foreign bodies; and Nature, as a rule, endeavours to eject that which is liable to prove a source of hindrance to the performance of her normal functions. But the fact remains, as already stated, gall-stones may be present in the gall-bladder, and no symptoms arise to indicate their presence.

If, then, we can have gall-stones and no symptoms, it is a little difficult to lay down any very definite signs which will admit—except under very evident manifestations—of a diagnosis being made. There is no doubt, however, that before distinct indications arise, many patients who

are the subjects of cholelithiasis will complain of dyspeptic symptoms ; they may suffer from flatulence, and a sense of weight and discomfort in the epigastrium after food. When, however, stones begin to assert their presence, they do so by signs that are fairly distinctive.

Among these must rank, as by far the most important, pain. It is frequently accompanied with a sense of nausea, and often with vomiting. The character of the pain is suggestive, indicating, as it usually does in the initial stages, an effort of the gall-bladder to rid itself of its contents. The pain at first is almost entirely of the "referred" kind. It is felt in the epigastrium, and in the right hypochondrium ; and in proportion to the amount of the stimulus producing irritation so does it become more diffusely distributed, being felt in the back, and up to the right shoulder. The pain usually comes on two, three, or more hours after food ; that is, at that time when the gall-bladder contracts in its natural endeavour to propel its contents into the duodenum. The appearance of the pain at this particular period is liable to lead to some confusion in distinguishing it from the pain connected with duodenal ulcer ; and it is only by carefully considering the facts in the case that differentiation will be effected. When the pain is the result of a stone in the common duct it is mostly more centrally situated, and complained of in the mid-epigastric region. Just as the pain may vary in its acuteness, so may it vary in the length of the time which it may last. It may prove completely prostrating in its effect : it may last for days.

Jaundice, accompanied with clay-coloured stools and dark-coloured urine, is a very variable symptom in cholelithiasis. It is due either to the impaction of a stone in the common bile-duct, or to inflammation of the mucous membrane of the gall passages. In the latter case, therefore, its occurrence in connection with gall-stones in the gall-bladder is purely accidental, and dependent upon whether stones so situated have set up a catarrh of the bile passages. It must never be assumed, therefore, that because a patient has not, nor ever has had jaundice, that gall-stones cannot be present.

But obstructive jaundice may be due to malignant disease situated at the duodenal orifice of the common

duct, or at some part of the same canal. It may also be the result of cancer of the head of the pancreas. The distinction between the two causes—stone and carcinoma—is sometimes very difficult; for while prolonged jaundice is the peculiar type of tumour obstruction, it is sometimes a feature of gall-stone catarrh. Many cases of persistent jaundice have been operated upon, in the almost certain belief that the obstruction was due to growth, only to find out that it was dependent upon inflammatory induration the sequel to a gall-stone. However, deep persistent jaundice, in patients considerably past middle life, and sometimes with but little history of early pain, should be regarded with suspicion.

When the obstruction involves the duct of the pancreas, so that the function of that organ is impaired, the question regarding the inflammatory or malignant involvement of the viscus may be settled by the employment of Cammidge's test. The test is a very delicate one, and not of much value unless undertaken by an experienced worker.

Palpation of the abdomen may or may not cause pain. If the patient is suffering at the time of examination from an attack of gall-stone colic, then the "referred" pain induces a reflex contraction of the recti muscles, and more particularly of the right rectus; it increases, also, the sensitiveness of the skin over the gall-bladder area. If, too, there is active inflammation, there will be marked tenderness to pressure.

The temperature may be raised during an attack of gall-stone colic; but if it persists longer than the acute pain, and especially, too, if there is marked tenderness in the gall-bladder region, it may be taken to indicate the presence of inflammation; and, therefore, that a septic element exists in the case.

If the disease progress so as to produce one or other of the numerous complications which have been above described, the symptoms may then no longer be those of cholelithiasis, but simply indications of the particular lesion which has arisen.

Distension of the gall-bladder is a symptom only occasionally met with. The distension may be due simply to mucus, in which case it is the result of a block at the neck of the gall-bladder, or of the cystic duct; or it may be

from bile the result of a persistent block, usually consequent on growth involving some part of the common duct. In cases where the gall-bladder is packed with a number of stones, it may be possible to feel the mass.

Prognosis and Treatment. I believe I am right in saying that nobody at the present day would venture to assert that by medicines they could cure gall-stones in the sense of dissolving them or removing them. It is reasonably possible by various precautionary measures—medical, dietary, and others—to prevent attacks of gall-stone colic, and thereby stave off also the various complications that might arise when such means are not employed. But when once gall-stones have formed, they must remain quiescent or they must either wait until Nature discharges them, or the surgeon removes them. And the crux of the situation lies in determining when Nature's efforts at quiescence or removal are no longer to be relied upon, and when, therefore, the surgeon should intervene.

If an experience based on over a hundred cases of cholelithiasis justifies me in expressing an opinion on the matter, I believe a first attack of gall-stones, unaccompanied with any symptoms of gravity, should be allowed to pass off, and treatment of solely a medical character carried out. Precautionary measures in regard to medicine, diet, exercise, &c., should in future be taken. There is always the possibility that such an attack may have been due to a solitary stone that has passed out and been discharged with the fæces, or that has been lulled to quiescence.

If a second attack occur, no matter at what interval of time after the initial attack—and, more particularly, if the attack is accompanied with fever and with marked tenderness in the hypochondriac region—operation is advisable, and for these reasons. The chief among them is that the stones have given distinctive evidence of their presence, and have also given an equally forcible indication that they may prove a subsequent source of more serious complications. What these various complications are has already been fully described; and, unfortunately, we are quite unable to forecast in any particular instance what may be the possible nature of the lesion likely to arise. The utmost we can say is that there are risks, and perhaps grave risks, in the future course of a case in which these ones have, so to

speak, become restless. We may be certain of this, that every additional attack adds to the danger and difficulty of any operation which may have to be performed. While the removal of a stone or stones from the gall-bladder prior to the development of other lesions is a perfectly safe and simple operation, such a measure adopted under more advanced pathological conditions may prove far from being so.

If delay can be entertained after a second attack, it should only be because small stones have been found in the fæces. For the character of the stones passed is probably a type of any others that remain ; and there is hope that whatever may still be retained may yet be similarly ejected. But the patient must be prepared to suffer agonising seizures. In a collection of stones which for some time I made, there was one lot which consisted of innumerable stones no bigger than a millet seed, and of much the same shape. The patient suffered excruciating agony in her attacks ; and notwithstanding the fact that she passed stones, the gall-bladder still contained a large number at the operation. This case, therefore, cannot be considered as lending much encouragement for a patient to wait in the hope that all stones will pass ; and, in any case, it is more than likely that an operation, sooner or later, will be requested to prevent the acute attacks of pain which the patient will begin to dread.

Of course, it may be that even after a second attack treatment and proper care will cause the stones to become again quiescent, and remain so for an indefinite period ; but such chances are much less likely to happen after a second than after a first attack.

The question is sometimes very naturally asked—If an operation is performed, is there any likelihood of the recurrence of the disease ? In an overwhelmingly large proportion of the cases in which *all* the stones have been removed no recurrence takes place. It is probable that if, after the removal of calculi, symptoms arise of a suggestive character, either all the stones were not removed, or the conditions which gave rise to their original formation still exist, and have been again the source of a new production. The former cause is likely to be by far the commoner ; for small stones may get partly encysted, lodged in diver-

ticula, or temporarily pass into the hepatic duct, from which they may descend at some time into the gall-bladder. Notwithstanding the most careful efforts at total extraction, I have had stones pass, every now and again, for weeks after the performance of cholecystostomy ; and I have also had a case in which, although the symptoms were unmistakably due to the presence of gall-stones in the gall-bladder, nevertheless, at the operation, none could be found ; but a few days afterwards some small stones appeared on the dressings, having passed out by the drainage tube inserted into the gall-bladder when completing the operation of cholecystostomy. An important consideration regarding prognosis in this particular respect is the patency of the neck of the gall-bladder, and of the cystic duct, demonstrated by the free flow of bile which takes place shortly after the stone has been removed and a cholecystostomy performed. When the passages are clear, there is much less likelihood of any recurrence from those causes which accident alone may have been responsible for in the original disease. Naturally, if the gall-bladder has been excised, no recurrence of trouble directly connected with it can arise.

Taking into consideration, therefore, all the points above raised, it seems as if the safest course to pursue, and the one most to be recommended, is to operate after the second attack has subsided ; or, during the attack, if the symptoms suggest that they have within them something more than a simple effort on the part of the gall-bladder to expel its contents.

Symptoms which suggest a stone in the common duct should always be regarded as incapable of alleviation except by operation. Stones so located may, in course of time, pass ; for, as the duct dilates proximal to the seat of impaction, the canal may gradually become widened sufficiently for final ejection into the duodenum. This, however, is probably a rare event in well-marked cases of obstructive jaundice ; so that harm rather than good may be expected by delaying operation for the realisation of any such faint hope.

In the operative treatment of gall-stones in the gall-bladder, considerable discussion has taken place on the question of whether or not the gall-bladder should be removed as a routine practice.

There is something to be said on both sides of the question ; but I venture to think that those who hold the opinion that removal should not be entertained unless proof is forthcoming that Nature has already distinctly indicated the viscus to be useless or a probable source of future mischief, occupy the soundest and most reasonable position.

Let me state more fully the advantages and disadvantages of the operation of cholecystectomy.

It is an advantage to leave the gall-bladder if it is still capable of performing its normal physiological part in the process of alimentation. This stands to reason, for the gall-bladder has an acknowledged function to fulfil, and however slight this function may be, that it is a positive factor is quite sufficient reason for our not ignoring it.

Another advantage lies in the use to which it is possible to put the viscus when, after the operation of cholecystostomy, we can utilise it as a temporary drain. This means that if, by any chance, we have not succeeded in removing all the stones at the time of operating, they can still find a means of exit. I do not suppose I am exceptional in my occasional failure to empty completely the gall-bladder and ducts at the time of performing cholecystostomy. For, two or three weeks after the operation, I have, by washing out the gall-bladder and exercising suction, removed small stones. I have, also, seen stones in dressings, which, without artificial measures for their extraction, have been ejected. But most striking of all, I have failed at the time of operation to detect stones, and yet a few days afterwards they have appeared. Of course, in all these instances the stones have been exceptionally small and very numerous ; just such that might escape removal, for various reasons, at the original operation for their extraction.

As a drain, also, the gall-bladder, in its attachment to the parietes, admits of any congestion of the pancreas being relieved. This has proved a most marked feature in certain cases ; and inflammation and not cancer of the pancreas has, through this measure, been shown to have been the cause of prolonged jaundice.

The advantages claimed for the removal of the gall-bladder are many. It is certainly an advantage to remove a gall-bladder that has become functionally useless.

There can be no doubt about the advisability of excising a viscus that is hypertrophied, shrunken, and bound down by adhesions, a pathological condition from which recovery is not possible. It cannot be brought up to the parietal wound for drainage purposes, and its retention is only likely to lead to subsequent trouble.

There is a condition which it is sometimes difficult to know how to deal with, whether to leave the gall-bladder or to remove it. We find the viscus distended with mucus, due to a block at the neck of the gall-bladder or in the cystic duct. The distension may be due to an impacted gall-stone, the removal of which may leave a patent canal ; but associated with the stones there may exist a good deal of inflammatory thickening which may or may not disappear in course of time. Unfortunately, we cannot, as a rule, know at the operation what may be the future result. For instance, in one such case where cholecystostomy was performed mucus continued to be discharged for a few weeks ; then a little bile commenced to come ; and, finally, what was practically a chronically discharging mucus fistula closed permanently. In another similar case, the fistula would close, the gall-bladder would refill with mucus, the patient would suffer discomfort and sometimes pain, all of which symptoms would at once disappear when the fistula reopened and the pent-up mucus escaped. This process of closing and opening continued, so that at last the gall-bladder had to be excised, and then the patient remained permanently well.

On the whole, therefore, I believe, it is wiser, in cases where the gall-bladder is found at the time of operation to be distended with mucus, to excise it then and there.

It is argued by some that it is wiser to remove the gall-bladder in very stout persons because of the dragging pain which is liable to follow stitching of the viscus to the parietal wound. There is something in the argument ; but there is this also, that in time this pain disappears, and the patient is no longer distressed by any discomfort in the region. There is little doubt that the tissues in time stretch ; and so accommodate themselves that no real dragging results. I have known this happen ; and,

therefore, prefer, even at the risk of a good deal of tension, to drag the gall-bladder up to the parietal wound, and secure it in the ordinary way.

When we consider the question of the operation itself, and by this I mean any operation for gall-stones, a few preliminary considerations are necessary. I used systematically to administer chloride of calcium, with the object, it was supposed, of increasing the coagulability of the blood; or, at least, to diminish the tendency to hæmorrhage which exists in all cases of cholæmia. I have not been so particular in this respect more recently, because I have been unable to satisfy myself that it effected this result.

The operation may be undertaken under three different conditions. The most favourable of these is where there is complete quiescence, or where there is no jaundice and no fever. A less favourable condition is when there is jaundice; and the least favourable condition is where there is a marked rise of temperature, and evidence, therefore, of a septic infection.

The second condition demands the greatest care with regard to the ligature of vessels. Unless every bleeding point is properly secured, there is the risk of a good deal of troublesome hæmorrhage. This may not prove of much gravity when the bleeding is from some vessel in the parietal tissues, although I have known a large quantity of blood lost under such circumstances; but should, by chance, the bleeding be from a severed and unsecured vessel in the omentum, or even in the detached adhesions, the peritoneal cavity becomes a ready and easy receptacle; and, as I know in one case, a fatal result ensued.

The least favourable condition in which operation can be performed is where there are marked evidences of septic infection; in other words, where the contents of the gall-bladder is not pure bile, but turbid or purulent material suggesting that active pyogenic or pathogenic micro-organisms are present. In cases of this kind, the utmost care must be taken to protect all parts in the immediate neighbourhood of the seat of operation. This is best effected by packing all round with sterilised gauze plugs before opening the gall-bladder; and when the stones have been removed—and possibly also the gall-bladder

excised—the peritoneal cavity should be shut off by stitching the omentum around the area, efficiently draining the region, and gently packing with iodoform gauze. If these precautions are well and thoroughly attended to, it is rarely that further septic complications will arise.

There are a few details of importance in connection, more particularly, with the operation of cholecystostomy. Surgeons vary in their choice of an abdominal incision. My own preference is for the right medio-oblique subcostal incision, about four inches in length, with further extension outwards and downwards if required. It gives a very free access to the gall-bladder, the common bile duct, and the duodenum; and leaves a cicatrix peculiarly exempt from subsequent weakness and the formation of hernia.

To facilitate the projection forwards of the gall-bladder and duct, a sand pillow is placed under the lower part of the chest. The parts around—after the separation of any adhesions—are carefully protected by the insertion of sterilised gauze plugs. The gall-bladder, secured at its fundus by two pairs of artery forceps, is drained of such fluid contents as may exist by means of a trocar and canula introduced between the forceps. The opening thus made is then enlarged, and the stones extracted. This may be effected in many ways, with ordinary dressing or special forceps, with scoops, by “milking,” by forcible injection of fluid, &c. It is with the fingers alone that we can be quite sure, in most cases, that all stones have been removed; and for this reason, therefore, a thorough external examination should be carried out, not only of the gall-bladder, but of its neck, the cystic duct, and of the whole length of the common bile duct. When satisfied in this respect, the closing stages of the operation are proceeded with. The opening at the fundus of the gall-bladder is stitched to the deeper parts of the parietal wound. If the mistake is made of securing the gall-bladder to the skin edges, a troublesome biliary fistula is liable to remain, which will require another operation before occlusion will take place.

Lastly, a drainage tube is fixed in the gall-bladder, and so connected with a long external tube that the bile may be conducted into a receptacle placed in the bed beside the patient.

There is little to be said with regard to after-treatment. If the stones were small, and there is the slightest reason to suspect that all have not been removed, the gall-bladder should be washed out on the second or third day, employing a suction syringe for the purpose. In this way small stones may often be extracted. When stones are thus subsequently removed, the drainage tube should not be finally left out of the gall-bladder until there is reason to believe there are no other stones to come. Under ordinary circumstances, however, there is no need to drain longer than from five to seven days. Bile will continue to escape by the fistula after removal of the tube for a variable length of time; and the time generally depends, I think, as much as anything, upon the size of the fistula made at the operation. However long it may take, it will eventually close, always assuming that the orifice in the gall-bladder was not stitched to the skin. In the latter case an operation will be required; the fistula must be freely excised, but the peritoneal cavity need not necessarily be opened to do so.

It is sometimes asked, Why should not the gall-bladder be opened, the stones removed, and the viscus closed and dropped into the peritoneal cavity (Cholecystotomy)? There are undoubtedly some cases in which this might, with perfect safety and certainty of cure, be done. But in the majority of instances it would entail risk, and render inert also one of the advantages which is effected through utilising the gall-bladder as a temporary drain. It need hardly be pointed out in detail, after what has already been said, what these risks and disadvantages are. Suffice it to say, that the success of cholecystostomy is so great and free from objections, that there is no reason to adopt a method, such as that of cholecystotomy, however tempting in its completeness, when it would unquestionably carry with it, in many cases, some very positive drawbacks. I think I have only once performed cholecystotomy (sometimes called cholecystendysis) for gall-stones; and that was in a case of cicatricial contraction of the pylorus following upon ulcer when a gastro-jejunostomy was done. By accident, I discovered that the gall-bladder had some stones in it. The patient's history had never given the slightest indication of their existence; and I believed them

to be perfectly innocent occupants of the viscus. I opened the gall-bladder, removed them, stitched it up, and returned it to the peritoneal cavity. The patient recovered as if only from the operation upon the stomach.

When stones exist either in the cystic duct or in the common duct, and cannot be squeezed back into the gall-bladder for removal from that viscus, they must be cut down upon, and extracted *in situ* (Choledochotomy); and to make sure no more stones exist in the ducts, a steel bougie should be passed both upwards and downwards through the incision in the duct. If the ducts are quite free it should pass easily upwards into the hepatic duct, and equally easily downwards into the duodenum. Rather than attempt to close the opening into the duct, a tube should be stitched into it in order, for a time, to drain off the bile. As leakage is almost certain to take place, a second tube should be placed close to the one introduced into the duct; and for still greater security, some iodoform gauze should be lightly packed around, and conducted out of the wound beside the two drainage tubes. The packing may be eased out on the third day, and completely removed by about the fifth day; while the external tube should remain a day or two longer, and the duct tube removed as soon as it loosens, which may be in ten or twelve days.

When a stone is felt to be impacted in the retro-duodenal or infra-duodenal part of the common bile duct, it can be reached by opening the second part of the duodenum (Duodeno-choledochotomy). A stone, for instance, impacted in the ampulla can easily be reached and removed by first entering the duodenum in its descending portion; the opening in the duodenum is closed after extraction of the stone.

It must always be remembered that stones in the gall-bladder may be accompanied by others impacted in the cystic duct and in the common duct; and although such a distribution is comparatively rare, its occasional occurrence should render a complete examination at all times necessary. For, it need hardly be said, to remove stones from the gall-bladder and let others remain in the ducts is to leave the patient pretty much where he was before operation, and necessitate a second search before a cure can be effected.

Excision of the gall-bladder (Cholecystectomy) is a very

simple and safe operation in most cases. If possible a ligature should be passed around the neck, and tied before complete severance. In so doing the cystic artery is secured. The viscus varies considerably in the breadth and intimacy of its attachment to the liver ; it is best to snip away the connection with a pair of scissors. The bleeding will often be fairly free ; but it is easily stopped by pressure with a gauze pad. A drainage tube should be conducted down to the stump of the gall-bladder or cystic duct ; for, inasmuch as the ligature only brings mucous surfaces together ; when the ligature loosens, often a free flow of bile takes place ; and it is safer that this should be conducted out of the abdomen than run the risk of leaking into the general peritoneal cavity before the channel has been well shut off by surrounding adhesions. Sometimes it is wise also, for similar reasons, to insert a little iodoform gauze packing, not only for protective purposes, but to check the oozing of blood from the raw surface of the liver left after removal of the gall-bladder.

The treatment of the various complications which may follow the presence of gall-stones would carry me further than the limits I have set myself in these few practical remarks on the subject of cholelithiasis. But as one rather rare sequel once came under my observation and treatment, I would like briefly to refer to it. The inflammation which so often accompanies gall-stones may, in very exceptional instances, lead to a complete and permanent cicatricial contraction of the ducts. If this contraction take place in such a way as not to interfere with the passage of bile into the gall-bladder, the establishment of an anastomosis between the gall-bladder and the duodenum (Cholecyst-duodenostomy) will effect all that is required. But if, as happened in my case, the involvement was such that bile could neither pass into the gall-bladder nor down the common duct into the duodenum, there was complete and permanent obstruction to all bile leaving the system except by the blood, and so by the urine. Only one possibility presented itself of diverting some of the bile into the intestine, and that by forming a direct connection between the dilated ducts in the substance of the liver itself and the intestine. The part of the bowel selected for the anastomosis was the jejunum,

because of the freedom with which it could be secured, and the absence of tension after fixation. The operation is described under the rather cumbrous appellation of Hepato-cholangio-jejunostomy ; inasmuch, however, as it is simply a union of the bowel to the liver, it might quite appropriately, and quite in keeping with analogous operations elsewhere, be more briefly designated, Hepato-jejunostomy.

The operation was first proposed by Marcel Baudouin in 1896, and a year later by Langenbuch ; but it was not until 1904 that Kehr of Halberstadt put it into execution. Kehr's case was published in the *Zentralblatt für Chirurgie* (February 1904). It was done for a cicatricial contraction of the hepatic duct. My own case was published in full in the *Annals of Surgery* (vol. xli, 1905, p. 56). Briefly, the operation consisted in opening the jejunum, and stitching it to the edge of an incised wound in the liver. The actual details as given were : "I was enabled, though with much difficulty, to suture the jejunum to the margin of the liver for about two inches by means of a continuous sulpho-chromic gut stitch. The liver was then incised for about an inch and a half ; the bowel opened for the same extent ; and the opposing surfaces beyond the two cuts were united by interrupted stitches." With regard to the operation itself nothing untoward happened, the man making a good recovery. But as regards the actual benefit incurred, it seemed as if for a time the jaundice was slightly less ; but improvement was not maintained ; and death ensued from gradually increasing exhaustion about two months after his operation. Those who would wish for fuller particulars of the case and the operation, I must refer to the original paper in the *Annals of Surgery*.

CHAPTER XX

ABDOMINAL GYNÆCOLOGY

ONE of the results of modern abdominal work has been to show that a great many symptoms attributable to viscera in the mid and upper abdomen find their origin in

affections of the female pelvic organs. And not only so, but the physical signs of tumours of these viscera may so closely simulate those of other abdominal viscera—such, for instance, as the stomach, the pancreas, the kidney, &c.—and vice versa, that mistaken diagnoses are frequently made. The obscurity, indeed, which surrounds the question of differential diagnosis is sometimes so great, that it is not until the abdomen is opened that the true nature of the disease is determined.

The practical bearing of these remarks touches the question of the responsibility which attaches to every operator who undertakes to open the abdomen for the treatment of disease within it. It allows of no sharp line of demarcation between the modern gynæcologist and the surgeon who has, more or less, specialised in the department of abdominal surgery. Rather does it imply that gynæcology is strictly a branch of abdominal surgery, and capable of being efficiently executed only by those who have already received adequate training in the general principles of surgery, and more particularly in the practices of its abdominal department.

The impracticableness of any effort to sharply differentiate between the gynæcologist and the surgeon, under the modern conditions which subsist in each of their departments, cannot be better exemplified than in the deplorable story once told me of a surgeon who opened the abdomen ; and on finding that the disease was connected with the female reproductive organs, said, that, as the affection did not belong to his department, he could do nothing further but hand the patient over to the right quarter ! There is only this to be said in the interests of the patient, and in extenuation of the surgeon's action, that, in the end, it was probably just as well for the welfare of the patient that the operator proceeded no further !

As an abdominal surgeon, I am fully prepared to allow that a properly trained surgeon who has specialised in gynæcology will execute, with greater expeditiousness, and with more certain beneficial results, operations upon the uterus, Fallopian tubes, and ovaries than one whose attention and efforts have not been so specifically directed ; and, also, that the same gynæcologist will be in a position to cope with such other complications and

revelations as may be, in certain instances, unexpectedly encountered.

But I am not prepared to admit, that a man who specialises in gynæcology, as if it were a department distinct in itself and in need of no knowledge other than that strictly associated with diseases of the female reproductive organs, that such a one is a fit and proper person to open the abdomen. I do not doubt the technical skill with which he may remove an ovarian cystoma, excise a uterus, or deal with a ruptured extra-uterine pregnancy; but I do question very gravely his ability to deal successfully with complications and revelations which only the experienced surgeon would know how to overcome with safety to the patient and with credit to himself. I am not basing my opinion on these matters upon merely theoretical considerations—although these alone, I think, must appeal with no little force to the unbiased judge—but upon personal experience; and upon this I would venture to assert, and to offer the advice, that no appointment to the post of gynæcologist should be made to any public institution unless the candidate can produce satisfactory evidence of having had sound training in the general principles of surgery; and has had practical experience, more particularly, in that department of the science which deals with the abdomen.

To give some practical force to these remarks, let me add a few illustrations of how, on the one hand, diseases of the female pelvic viscera may produce derangements of other abdominal organs; and, on the other, of how affections of certain abdominal viscera may simulate those of the reproductive organs; and, also, of how associated complications may exist rendering essential a wider knowledge than that which is usually attributed to the too exclusive specialist.

Functional disorders not infrequently arise from over-excitation and irritation of the uterus and adnexa. The stomach is peculiarly susceptible in this way; and nausea and vomiting are sufficiently well-known symptoms in connection with uterine and ovarian disturbances.

“Referred” pain is one of the most distinctive, as it can be one of the most misleading, symptoms in connection with affections of the pelvic viscera. For, should the “referred”

pain be limited, as it may be, to one or other iliac region, it at once allows of its true cause being overshadowed by the possibility of disease of the appendix or cæcum, if the pain is felt on the right side ; or of the iliac or pelvic colon, if located on the left side.

Pelvic peritonitis, dependent on the extension of inflammation from the uterus or Fallopian tubes, may lead to intestinal obstruction, both chronic and acute, the result of the involvement of the intestines in the adhesions which subsequently form. The bowel may be sharply kinked ; or it may be actually constricted by fibrous bands.

When the question is one of determining the nature and origin of a tumour that occupies the greater part of the abdomen, the difficulties of differentiation are often considerable. An ovarian cystoma may swing itself so completely free of the pelvic cavity that it is impossible to say, before opening the abdomen, that the tumour had its origin in that region. A large cystic kidney or an enormously distended gall-bladder may be, and, indeed, have been, mistaken before operation for ovarian cystomata. Even a large sarcoma of the greater curvature of the stomach has, on more than one occasion, been diagnosed as a tumour of the ovary.

But examples without number could be quoted of the great difficulty, and often impossibility, of definitely stating before operating whether a particular tumour felt within the abdomen had its connections primarily with one or other of the reproductive organs, or whether it was associated with some distantly placed abdominal viscus.

In the case of acute crises, a ruptured tubal pregnancy may quite easily be mistaken for some other equally acute lesion, a perforated appendix, for instance. An acute appendicitis may often be found when an acute salpingitis was anticipated, and vice versa.

But double complications sometimes exist. I cannot recall where I have seen the subject referred to ; but it has come within my own experience to operate for a large ovarian cystoma in the belief that it was the cause of the chronic intestinal obstructive symptoms which formed the patient's chief complaint. Instead, however, of the bowel being simply pressed upon, as considered possible, it was

mechanically obstructed by a comparatively tight carcinomatous stricture in the iliac colon. Not only, therefore, had the ovarian tumour to be removed, but the involved portion of the bowel had to be excised also, and the continuity of the canal re-established by an anastomotic operation.

The association, however, of an ovarian cystoma with intestinal complications finds another striking example in the intimate adhesions which may form between the bowel and the tumour. The attempts at separation may lead to serious laceration of the bowel wall ; and unless the latter is dealt with in a proper way, a fatal peritonitis is certain to ensue.

I think I have said sufficient to support the view, already expressed, of how inseparable is the association between gynæcology and abdominal surgery looked at from its broader aspects ; and, also, that the gynæcologist is not fully competent for the proper execution of his department unless he has a fairly good knowledge of general abdominal surgery. Nor, with equal force, is the surgeon who makes a special profession of abdominal work fitted to execute adequately his pretensions unless he possess the requisite amount of knowledge of gynæcology. But with the combined knowledge each will carry out his own department relatively with greater efficiency ; and, what is of essential importance, each will be capable of properly treating such unexpected or accidental contingencies as may, and certainly will, from time to time be encountered.

I have no intention of attempting to describe the various diseases of the female reproductive organs which require treatment by abdominal operation. I should not consider it my department to do so ; and what, perhaps, is more to the point, I could not if I wanted to. What, however, I do wish to say is based on such experience as I have had in operating on these particular cases, come as they will, every now and again, both intentionally and accidentally.

A few preliminary remarks on the preparation of certain cases will not be out of place.

Let us suppose we contemplate performing hysterectomy, either partial or complete, by the abdominal route. We are careful enough over the preparation of the skin of the abdominal parietes ; but are we equally so over the

mucous membrane of the vagina ? We are going to make a wound below as liable to infection as that above. We may as readily infect the peritoneum through the vaginal or cervical incision as we may through the abdominal one. Should we not, therefore, pay just as much attention to disinfection of the mucous membrane of the vagina as we do to sterilisation of the skin ?

If the operation is a complete or partial hysterectomy for a non-infective disease like uncomplicated uterine myomata, the vagina should be douched for two days previously, morning and evening, with one in forty carbolic solution. On the morning of the operation after the douching, the vagina, if possible, should be lightly packed with a strip of iodoform gauze. This is withdrawn at the operation. At the conclusion of the operation the vagina is again loosely packed with gauze. The packing is removed after forty-eight hours ; and daily douching recommenced. Care must be taken that the gauze does not become soiled with urine. To prevent this, therefore, the urine should be periodically drawn off so long as packing is present.

If the hysterectomy is for carcinoma of the cervix or the body of the uterus, still greater care is required in attempting to disinfect the vagina. In many cases of this kind it is wise to perform a preliminary curetting of the part with a free application of some caustic agent, such as acetone, or pure carbolic acid. Such measures may help, but cannot, in many instances, more than partially remove the risks of sepsis. Every precaution must be taken to guard the surrounding parts of the peritoneal cavity from contamination with infective discharges from the uterine cavity when cutting through the vagina. When there is any fear of the possibility of infection, such as exists usually in extensive disease of the viscus, the pelvic cavity should be drained through the vagina.

In an earlier chapter (Chapter III) I have discussed the relative advantages of transverse and median incisions for approach to the pelvic viscera. I shall, therefore, say no more here than that I invariably use the curved incision starting from about the middle of Poupart's ligament on the one side to a similar point on the other. It is sometimes

quite sufficient to forcibly drag aside each rectus muscle. But I have not the slightest hesitation to divide each muscle across its fibres if necessity demands freer access than can be acquired without doing so. For the sake of again enforcing the immediate utility and future security of such free transverse incisions, I may refer to Fig. 5 (p. 39), which illustrates a very typical and extreme case successfully so operated upon.

In the removal of all tumours associated with the ovary and broad ligament, there are the greatest variations in regard to the breadth and thickness of the pedicle. Some pedicles are so small and narrow that a single ligature encircling the tissue is all that is required. Others, again, can be safely secured with a Staffordshire knot. But, if neither of these simple methods seem likely to supply the necessary constricting effect upon the pedicle, a more elaborate mode of suturing must be adopted.

The danger of secondary hæmorrhage taking place from the stump is a very real one ; and has to be carefully guarded against. I had to learn the lesson, as many others have had to, by bitter experience. Increasing pallor, with sighing respiration, restlessness, an easily compressible and rapid pulse, coming on shortly after the patient has been returned to bed, all tell only too plainly that the stump ligature has slipped and that bleeding is taking place freely into the general peritoneal cavity. Promptness in reopening the wound and securing the bleeding vessel may effect the requisite result ; but it does not remove from the mind of the operator the uncomfortable feeling, that what had happened and what had had to be done were all evidences of an error which ought not to have been committed.

The way such a mishap comes about is this. If a ligature encircle a pedicle which is large, and is tied when there is tension on it, it is never likely to get a tight constricting effect upon the included blood-vessels. The result, therefore, is that, as soon as the pedicle is severed from its connections with the tumour, or the clamp forceps have been removed, there is a laxity of the tissues grasped by the ligature. For the time being this grasp may be sufficient ; but as the patient recovers from the anæsthetic, and the shock of the operation passes off, the tension in

the blood-vessels increases. This, by adding to the vascularity of the tissues proximal to the pedicle ligature, causes them to swell; and thereby, through tension, to withdraw the insufficiently gripped vessels from the constricting loop. Thus, the pedicle ligature may be completely cast off, and the vessels left free to bleed into the pelvic cavity (*see* Fig. 33).

In order to avoid the possibility of this catastrophe, and to secure that the ligature when once tied cannot slip,

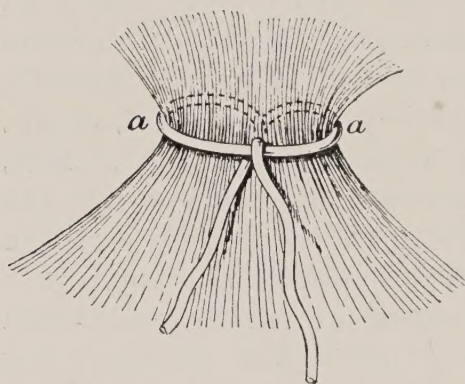


FIG. 33. Diagrammatic representation of an ovarian pedicle with "Staffordshire" knot passed but not tied. *a, a* show where, in broad stumps, the tissues are liable to slip from within the ligature.

two special precautions are necessary. The first is, that while tension is being placed on the first knot, the pedicle distal to it should be severed; or if the tumour has been already removed, the clamp forceps should be relaxed. By this means the tissues are completely freed, and the full force of the constricting effect of the ligature can be brought to bear upon all vessels contained in the pedicle. These remarks apply to a pedicle which can be quite safely

treated either with a single encircling ligature, or with a "Staffordshire" knot. When the pedicle is too broad to be occluded in this way, the second precaution must be taken; and that is, that it must be tied off in parts.

The plan I am now in the habit of using will be best understood by a reference to the illustration (*see* Fig. 34). It consists in tying off the pedicle by three, four, or more interrupted ligatures. These are passed by means of an aneurysm-needle, but the outer or upper one, which includes the ovarian vessels, is introduced somewhat differently. After one end has been passed through the pedicle by means of the aneurysm-needle, the latter is removed and the end threaded into a sharp-pointed needle. By means of this it is made to transfix the pedicle quite close to its edge (at *b*). It is then brought a second time through the original puncture, and finally tied in the usual way.

The express object in view, by transfixing in these two places, is to prevent the possibility of the outer edges of the ligament with its ovarian vessels slipping from beneath a singly applied loop.

Another point to which I would draw attention is, that, in cutting through the pedicle, the severance should be beyond the apertures or spaces created by the tightening of the ligatures. By so doing it renders it impossible for any one of these ligatures to slip off. Lastly, there is always the possible risk that a bleeding point may be found at the lower angle of the spaces (*c, c, c*) caused by the slight tearing of the tissues in tightening the knots. These points, therefore, should be carefully examined. Any vessels thus opened can be easily secured.

While I have always felt an aversion to the use of non-absorbable material for buried ligatures and sutures, I make an exception in the case of pedicles constituted principally of the broad ligament. For these I prefer to use silk, and for two reasons : first, that it is stronger than any kind of gut, and, therefore, allows of greater tension being employed ; and second, that when the first knot is tied, it is not likely to slip while the second is being tightened.

After the removal of any or all of the reproductive organs there is an important detail in the concluding stages of the operation which should never, when possible, be neglected. It is, that all stumps and raw surfaces should be buried beneath the peritoneum. It is not always

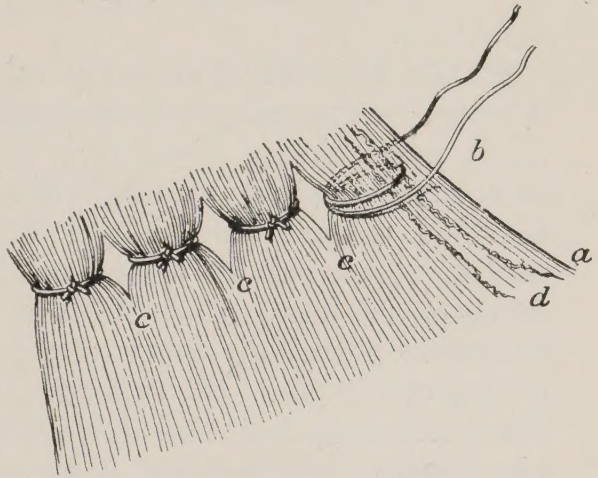


FIG. 34. Method of tying broad pedicles after the removal of large tumours of the ovary or broad ligament. *a*, Free edge of ovarian ligament; *b*, point close to the margin of the ligament through which the stitch passes in making a second circuit around the stump to prevent slipping; *c, c, c*, angles of separation between ligatures where bleeding points should be looked for and secured; *d*, ovarian vessels caught in the final loop of the outer ligature.

possible, although in most cases it certainly is. The reason for adopting the practice is that any raw, unprotected surfaces will contract adhesions with parts that may lie in contact with them. Thus, it comes about that coils of small intestine become adherent to the floor of the pelvis; with the result that kinks and contractions may give rise to attacks of acute or chronic intestinal obstruction.

In the removal of large tumours from the pelvic cavity, whether connected with the uterus or the ovaries, and more particularly when they are accompanied with adhesions intimately uniting them to the pelvic parietes, there is considerable danger of injury to one or other ureter. If it can be done—but it needs a practised and experienced hand to do it—a ureteral bougie or catheter should be passed up each ureter prior to the commencement of the operation. By this means the ureter can be more distinctly felt, and, therefore, more easily avoided. With the greatest precaution, however, it sometimes happens that the ureter gets torn. If the lesion does not completely sever the canal, it may be stitched up; and if it does, it may be possible to invaginate the proximal end into the distal and stitch it there (Uretero-ureterostomy).

But it may so happen, as it did in one of my own cases, that the latter remedy could not be carried out. The proximal part of the canal, however, was sufficiently long, after feeling its upper portion, to permit of its being drawn down and implanted into the bladder (Uretero-urinocystostomy). To prevent the possibility of leakage, I, first of all, introduced a ureteral catheter into the ureter, passing the other end through the bladder and out through the urethra, where it was secured. This drained the urine completely away, and allowed an uninterrupted recovery from the accident.

Sometimes the ureter is unknowingly injured; and it is not until the later formation of an external urinary fistula takes place that the fact is forced upon the operator of the accident that has happened. The lesion may have been of so slight a character that it will heal, and the continuity of the urinary canal be re-established, when, of course, the external fistula will close. Should, however, this happy result not follow within a reasonable time, the

extreme discomfort caused to the patient by the constant soaking of all external dressings with urine will necessitate the removal of the kidney on the affected side.

CHAPTER XXI

ABDOMINAL TUMOURS UNCONNECTED IN THEIR ORIGIN WITH THE VISCERA

FROM the great frequency with which inflammation or growth involves some viscus within the abdomen, one is apt to lose sight of the fact that there are various lesions which may have an intimate connection with some abdominal organ ; but which, nevertheless, are quite separate and distinct from it. They may also present symptoms and physical signs likely to mislead, if the fact of such possible dissociated conditions are not borne in mind. It is with a few of these that I wish to deal in this chapter. The peritoneum is excluded in so far as it practically forms part of the viscus, which it may partially cover or completely envelop.

Tumours of the omentum are occasionally, though comparatively rarely, met with. They are usually cysts of some kind ; and such solid tumours as have been found are either of the nature of lipomata or fibromata.

In peritoneal tuberculosis, the omentum is sometimes puckered up and thickened to such an extent that it forms a distinct mass in the upper part of the abdomen, which can be easily palpated. Strangely, in two cases which have come under my own observation, a mass was felt in the right iliac fossa ; and when explored, the tumour, in each instance, proved to be a greatly thickened tuberculous omentum. The two cases are fully reported in my work on " Abdominal Tuberculosis " (p. 325).

Cysts of the mesentery are also occasionally encountered ; and, as an illustration of such, I may describe a case that I had which, so far as I can ascertain, seems almost unique, that is, as regards its pathological or structural character.

John M., aged thirty-three years, entered the infirmary on account of a swelling in his abdomen. He stated

that although he suffered from occasional attacks of indigestion and constipation, his health on the whole was good. It was his medical man who accidentally discovered a tumour when palpating his abdomen, and advised him to see a surgeon. It did not cause him any discomfort ; and he would have been unaware of its existence but for the fact that his doctor had told him of it. On palpation of the abdomen a firm mass could be felt in the epigastrium just below the left costal margin. It was slightly tender to pressure. In view of the possibility that it might grow larger and cause some trouble, I advised him to have it removed. The abdomen was opened by a transverse incision one inch above the umbilicus. The right rectus was notched, but the left rectus muscle was not touched. The tumour was found in the mesentery of the jejunum. It was delivered through the abdominal wound, and shelled out from between the layers of the mesentery. The opening in the mesentery was stitched up, and the abdomen closed.

The cyst was about the size of a man's first ; with a tough, uniform, fibrous, non-vascular external covering. When cut into, it was found to contain a mass of cream-coloured, putty-like material, quite uniform in consistency ; and typical of what might be regarded as sebaceous material. There were no signs of the presence of hair or of calcareous substance. The pathologist reported that the tumour was "of the nature of a dermoid cyst." That a dermoid tumour should be found within the abdomen of a male subject is a developmental freak of exceptional curiosity.

Sarcomata arising from the cellular tissue, beneath or under the peritoneum and projecting into the abdominal cavity, may cause symptoms and give physical manifestations that render it sometimes very difficult to determine whether they are or are not in their origin independent of the viscus with which they appear to be so closely associated.

A not uncommon seat for the growth of a sarcoma is in one or other iliac fossa. As the tumour increases in size it may press upon and obstruct the colon, so suggesting that the tumour is primarily of bowel origin. The same thing happens when the growth takes place from the sacrum ; the rectum then gets unduly pressed upon, if not actually invaded, and obstructive symptoms arise.

The difficulty connected with diagnosis is considerably diminished when we examine the parts directly through an incision into the peritoneal cavity. The extreme fixity and breadth of attachment to the parietes may be taken as strong presumption in favour of the growth being parietal and not visceral in origin. Fixity of attachment, however, is not always a clinical feature of diagnostic significance, for the growth may take place from loose cellular tissue not in direct continuity with the parietes. The tumour, then, if not what might be termed freely movable, is, at least, sufficiently mobile to convey the impression that it probably arises from, and is actually in intimate association with, some viscus. This particular feature was strikingly exemplified in the case of a boy admitted to my ward in the Victoria Infirmary with a large swelling in the left lumbar region. Judged solely from the situation, and other physical features connected with it, it might quite well have been mistaken for a large spleen or kidney. The case is, I think, of sufficient interest to record.

The patient was a boy, aged eleven years, who, according to his own statement, had felt quite well until about three weeks prior to his admission. He then began to lose his appetite, and more recently had vomited. In appearance, he was a delicate-looking child, thin, but otherwise there was little to note about him. On examining the abdomen there was a visible fullness on the left side just below the ribs. On palpation, a mass was felt to extend from the umbilicus well into the lumbar region, and to lose itself upwards under the ribs. A sharply defined margin could be made out anteriorly; to percussion the note was dull. The cutaneous veins over the swelling were noticed to be somewhat prominent. The mass was very firm and tense in consistency suggesting more a solid than a cystic tumour. There was no pain or tenderness on pressure; nor did a deep breath cause any discomfort. His bowels were quite natural and his urine normal. The abdomen was opened by a transverse incision extending from just above the umbilicus five or six inches outwards. The colon was first encountered lying over the tumour; and on dividing the outer sheath of the transverse mesocolon, it was freely exposed. It was then found possible to deliver the

mass, which had a very vascular connection. On division and ligature of these vessels, removal was easily completed. On examining the bed on which the tumour lay, the bare surfaces of the spleen and kidney were seen. The tumour, therefore, seemed to have taken its origin from the cellular tissue in front of these viscera. The operation took twenty-five minutes ; and was well borne by the child, who made an uninterrupted recovery.

The tumour was of the shape and size of a coco-nut, though somewhat lobulated. When divided it was seen to be quite solid with areas of a somewhat gelatinous-looking material ; and in other places indications of calcareous degeneration. The pathologist's report of the microscopical characters of the tumour was that it was a "Sarcoma of mixed variety, the spindle-celled and round-celled elements being equally proportioned. A number of small hæmorrhagic areas scattered throughout the section were seen. The tumour might be regarded as developmental in origin."

A few weeks later the boy returned with very marked evidence of recurrence of the growth.

Tuberculosis is responsible, in more ways than one, for abdominal lesions unconnected with the viscera. I have already alluded to the way in which the omentum may assume the form of a tumour. But of more frequent occurrence is tuberculosis of the mesenteric or the lumbar glands. In affections of these structures, we may have a mass the result of the enlargement of several glands, or the tumour may be due to the increase in size of a solitary gland. I have dealt with the subject fully in "Abdominal Tuberculosis" (p. 173), and do not intend, therefore, to more than briefly refer to it here.

The disease, when it affects the mesenteric glands, is usually secondary to some antecedent bowel lesion ; so that, not infrequently, the history of the case will reveal symptoms suggestive of the nature of the complaint. The question of dealing with these glands operatively has now for some time been entertained ; and, in not a few instances, extensive removals have been successfully accomplished. Excision, however, is by no means a safe practice to adopt in all cases ; nor, indeed, is it always necessary to attempt removal even in advanced conditions

of the disease. I give elsewhere (*see* "Abdominal Tuberculosis") cases illustrative of both of these statements. It must be remembered that with many of these tuberculous glands there is mixed infection; so that, should the contents of a gland gain access to the general peritoneal cavity, it will very probably set up acute peritonitis. This is what happened in one of my cases, although every possible precaution was taken to guard the cavity from infection. It is advisable, in treating these cases, to stitch the peritoneum, as much as possible, over the gland that has been scraped, or rather over any remnants that have necessarily been left behind; or, if this is not possible, to pack the part with iodoform gauze and drain.

As illustrating the wisdom sometimes of not attempting to remove a gland or a mass of glands which has or have become so adherent that shelling out cannot be effected or scraping satisfactorily done, I may mention the case of a young woman, aged eighteen years, in whose abdomen there existed—in the epigastric and left hypochondriac regions—a freely movable tumour. It gave the impression, from its shape and size, of a movable kidney. When the abdomen was opened the tumour was found situated between the layers of the mesentery, fluctuant, non-adherent to the surrounding parts, but so intimately and diffusely connected with the mesentery that any attempt at removal would have endangered the vitality of a considerable portion of the intestine. She had been under treatment for tuberculous cervical glands; so, for that and other reasons I need not detail, it was considered highly probable that the tumour was a tuberculous gland or mass of glands. Nothing further, therefore, was attempted; and the abdomen closed. The tumour gradually diminished in size, and eventually entirely disappeared. The patient lost all the symptoms, including a persistently heightened temperature, which she had while the tumour was present.

The retroperitoneal glands situated along the anterior surface of the spine sometimes become infected with tuberculosis and enlarge, forming a tumour which can be felt through the anterior abdominal parietes. That such may mislead into the belief that some viscus is involved was well illustrated in a case sent into my ward at the Victoria

Infirmary under the impression that the patient was suffering from intussusception. The case is well worth recording.

The patient was a girl, aged ten years. She was admitted at 12.5 A.M. as an urgent case. It was stated that she had been perfectly well until Thursday morning, when at 4 A.M. she was awakened with sudden severe pain around the umbilicus, but more marked on the right side. The pain gradually eased off, and completely disappeared after about twelve hours from the onset. She got up, but at night the pain again slightly appeared and remained all Saturday until about 3 P.M., when another acute seizure came on similar to that with which she was first attacked. She vomited slightly on Thursday morning, and again on Friday. Her bowels moved regularly prior to the onset of her illness; and Thursday, Friday, and Saturday they also moved naturally, except that on Saturday afternoon only a small quantity of fæcal matter came away, and this was accompanied with some mucus, but without any signs of blood. She was then first seen by a doctor who, feeling a lump in her abdomen, and recognising the urgency of her symptoms, ordered her immediate transference to the infirmary.

On admission to the hospital, she was seen to be well nourished and did not look particularly ill. Her only complaint at the time was slight pain in the region of the umbilicus, and more particularly on the right side. Her tongue was coated with a whitish brown fur, and was moist. Her pulse was 100 and her temperature 99.4° F. On examination of the abdomen, there was nothing abnormal to inspection, but by palpation a mass about the size of a hen's egg was felt extending from the level of the umbilicus upwards, and just beneath the outer border of the right rectus. It was immovable and very hard, but tender to pressure. It could be defined laterally and at its lower margin. The previous health of the child was ascertained to have always been good. There was no history of diarrhœa at any antecedent period of life, or of any other gastro-intestinal disturbance. There was also no history of tuberculosis in other members of the family.

The case was seen in my absence by Mr. Farquhar Macrae, who, an hour after admission of the patient to the

infirmery, operated. The mass felt externally was discovered to be enlarged retroperitoneal glands, mostly hard in consistency, but in places soft and fluctuant. An incision was made into the mass ; and as it was found to be tuberculous, as much of it was scraped away as possible, the peritoneal cavity around being carefully protected with lint. The cavity left after the scraping was touched with pure carbolic acid and packed with iodoform gauze, the end of which protruded through the abdominal wound. The patient was dismissed from the infirmery, about two months after the operation, perfectly well.

Another form which a tuberculous lesion may assume, and mislead into the belief that the tumour in the abdomen is possibly of visceral origin, is that of a psoas abscess. In the particular instance which came under my own observation, the supposition was that the patient had possibly a tuberculous cæcum. Here, again, I think the case sufficiently instructive to describe briefly.

A married woman, aged thirty-five years, was admitted to the Victoria Infirmary suffering from tuberculous disease of the metatarsal bones, and with other local evidences of tuberculous lesions. In addition to these, she gave the history of griping pains occasionally felt within the abdomen. These she had suffered from for about two years. At times, she was constipated, and her abdomen would swell. At other times her bowels were very loose. As far as her abdominal pains were concerned, she stated that, as a rule, they came on a week before the onset of menstruation. On examination of the abdomen, some tenderness was felt in the right flank, and in the upper part of the left flank. In the region of the cæcum and ascending colon, there was a swelling presenting a slightly irregular surface.

The abdomen was opened by a gridiron incision in the right iliac region. The peritoneum and bowel were found normal. On the right side a retroperitoneal swelling was detected with uniform fluctuation. A similar, but not so marked, swelling was felt on the left side. These swellings represented a double psoas abscess. Nothing further was done and the abdomen closed.

One of the most remarkable, as it was one of the most puzzling, cases that ever came under my observation was

that of an abdominal aortic aneurysm. Although the tumour was not detected until its nature was manifest, it had given rise to symptoms that at first were most misleading; for they almost solely directed attention to a possible catarrhal inflammation of the colon. The case was so unique at the time that I wrote an account of it for the *British Medical Journal*, July 28, 1900, with various comments which I need not introduce here. But the account of the case may quite well be repeated. The patient, an engineer, aged thirty-five years, was admitted into a private Nursing Home suffering from a bowel complaint of eighteen months duration. He was unable to ascribe the commencement of his illness to any particular cause. He believed he once suffered from dysentery when in Egypt. His trouble had consisted mostly in obstinate constipation, with the occasional passage of mucus in the motions. It was stated that, on one occasion, a mucous cast of the bowel had been passed. The small flakes of lymph that passed were on more than one occasion submitted to microscopical examination. They were found to consist of merely mucous shreds in which were entangled debris of granular material; neither blood nor pus-cells were ever observed. Pain became, in the later stages of his illness, a very trying symptom. He stated that he suffered most pain in his bowels prior to the passage of accumulated masses of lymph. The administration of an enema always produced a sense of considerable soreness in the left lumbar region if the amount introduced exceeded two pints. He further complained of more or less constant "nipping, burning pain" about the eleventh and twelfth ribs in the left axillary line, with tenderness when digital pressure was exercised over this area. His most severe pain, however, was in the region of the epigastrium, which, at night, so distressed him that morphine had to be given. He always felt pain if he attempted to move or sit up, and selected the almost prone position as that which afforded him most ease. About twelve days after he had been under my observation, a pulsating swelling suddenly appeared in the left lower dorsal region close to the spine. It was about four inches in length and three inches in breadth, occupying a position in the region of the vertebral ends of the ninth, tenth, and eleventh ribs. The

pulsation was as marked as if the aorta itself was exposed. The patient complained of a throbbing sensation in the swelling, and also of much discomfort from flatulence. The "wind," he said, collected on the left side and bulged his abdomen there. This was quite evident on inspection. Palpation elicited an unduly flaccid condition of the abdominal parietes, and percussion gave a highly tympanitic state of the bowel beneath. He now complained of pains radiating from the region of the swelling round to the front of the abdomen, and a loss of tactile sensation. He remained in much the same condition for about twenty-four hours, when, on the nurse returning to his room after an absence of about ten minutes, she found him dead, in the same position as she had left him.

Without attempting to discuss the case at length, it may be indicated that the bowel trouble, if not due to an entirely independent condition of chronic mucus colitis, probably found its explanation in the pressure effects produced by the aneurysm upon the mesenteric vessels. This pressure had probably led to congestion of the mucous membrane, and so to the mucous discharge in the motions which was one of the original misleading features of the case. I mentioned the case, at the time, to the late Sir William Gairdner, an acknowledged authority on the subject of aneurysm, and as far as he could recall he had only once, many years ago, met with a similar case where an abdominal aortic aneurysm had presented posteriorly.

In concluding these remarks upon non-visceral tumours of the abdomen, it may be incidentally noted that occasionally swellings from inflammation or growth may exist in some part of the anterior abdominal parietes, and convey the impression that the condition arises from something within the peritoneal cavity. I remember once cutting down upon a hard nodule, deeply seated in the epigastric parietes, under the impression that it had intra-abdominal connections, only to find, however, an encysted needle. How it got there I never ascertained, for no history was forthcoming of the patient having swallowed such an object; nor did she ever remember its entrance, in any other way, from without.

CHAPTER XXII

REMARKS ON NEPHROPTOSIS AND NEPHROPEXY

My chief object in this chapter is to ventilate a method of fixing the kidney which I have now employed for some years ; and with a success that encourages me to believe that its adoption fulfils as much the requirements of simplicity in performance as it does of certainty in permanent fixation. Before, however, describing the operation let me introduce a few remarks on nephroptosis itself.

Many symptoms have been and are attributable to a "movable" and "floating" kidney. Some of these are the result of purely mechanical causes ; while others doubtlessly arise from disturbances set up in the nervous system by irritation evoked through the displacement and mobility of the viscus.

This fact, however, remains, that the kidney may be "movable," and yet the patient oblivious of any such displacement and entirely free from the manifestation of any symptoms. There is this fact also, which, I think, is worthy of some attention, and that is, that many patients do not complain of certain symptoms until they have had their attention drawn to the fact that they have a mobile viscus. The discovery is frequently quite an accidental one on the part of the medical attendant, and while it probably has no connection whatever with the symptoms for which the doctor has made his examination, the knowledge of its existence acquired by the patient calls forth a sense of nervousness and anxiety which proves a perpetual source of subsequent trouble. The truth of the matter is, that a certain amount of nephroptosis is extremely common in women, and when discovered accidentally, and not deemed by the physician of any moment in the case, its existence should be withheld from the knowledge of the patient ; and when discussing the matter in the presence of the patient the technical expression, nephroptosis, should always be employed.

That there is good reason for extensive variety in the

symptoms which may manifest themselves, there can be no possible doubt. Rarely, indeed, are two cases alike. Take, first, the mechanical causes. When the kidney falls from its position, it may itself, or by means of the peritoneum which passes from it over the duodenum, so press upon or constrict the latter that obstruction results. This may be little more than sufficient, for a time, to interfere with the normal process of gastric digestion ; but, sooner or later, it may lead to dilatation of the stomach ; and so to all the physical and functional signs usually associated with that condition.

But the dropping of the kidney may result in mechanical obstruction to the structures entering and leaving the hilus of the viscus. In this way the ureter may be kinked ; and the urine thus dammed back lead to attacks of hydro-nephrosis. Symptoms, therefore, would result dependent on derangements of urination, not to speak of the pain which would also be produced.

Should the obstruction interfere with the return of the blood from the kidney, as would happen if the renal vein were kinked, congestion of the viscus would ensue with blood in the urine, and other symptoms indicative of such a complication.

The effect on the nervous system may be considerable ; for the kidney with its superimposed capsules is abundantly supplied with nerves through the renal and suprarenal sympathetic plexuses. These plexuses are themselves intimately associated with the semilunar ganglia, which in their turn are practically part of the great solar plexus. It will thus be seen how extensive are likely to be the ramifications of disturbances set up by a kidney which is subjected to all kinds of influences by reason of its foreign excursions. Certainly, so far as the clinical histories of the symptoms of pain are concerned, there is the greatest possible variety, both in regard to the situation of the pain, and its character and intensity.

The only class of cases that it is difficult to explain on the basis of cause and effect is that in which the patients are sufferers from so-called neurasthenia, and from mental derangements. If there is any association, it can only be that there pre-exists a nervous instability which is stimulated or exaggerated by the irritative effects of a movable

kidney. Perhaps this is the explanation of the relief which is said to follow nephropexy in such cases. On the other hand, there is always the possibility—as we know exists in all patients with a neurotic temperament—that the mere performance of an operation may have a beneficial effect by reason of the powerful, impressionable influences exercised on the brain. My own experience in this class of cases, however, is too limited to express any opinion as to the advantage or otherwise of subjecting these particular cases to operation.

It is not usually difficult to palpate a movable kidney. When the displacement is slight, the viscus will hardly be detected unless the patient take a deep breath, and so assist in somewhat pushing it down. When it has wandered freely from its bed, and is what is termed “floating,” it can be easily felt, and can be distinguished from other movable tumours by the peculiar sickening sensation evoked by pinching or squeezing it.

While women are almost exclusively the subjects of nephroptosis, now and again the condition is encountered in the male sex. I have only once observed a movable kidney in a man. The physical conditions were so unlike what one is accustomed to meet with in the female, that is to say, there was no undue laxity of the abdominal parietes, that one was tempted to believe that the kidney must have originally possessed a mesonephros, and, therefore, that the displacement was of developmental origin.

The patient, who was a railway guardsman, was thirty-nine years of age. He had been under treatment nine years previously with symptoms suggestive of stone in the left kidney. It was ascertained that at this time his kidney had been explored for stone, but that nothing had been found. He stated also that, while the pain at that period was mostly on the left side extending down to the testicle, he occasionally felt pain in the right testicle. When admitted into the infirmary, he gave the following history of his symptoms. For about five years, he had suffered pain in the right side, which, more recently, had increased in frequency and severity. He described the pain as “dull, and associated sometimes with a sickening feeling” which had twice caused him to vomit. He stated that he occasionally felt a lump in his side; and when he lay on his

back he felt something "going up and down in his belly." He also stated that during the last six years he had frequently to pass his water. The man himself did not look very robust, but his organs appeared sound. A sausage-like lump could occasionally be felt in the right lumbar region. It easily slipped from beneath the hand. The patient could himself catch it quite well, and stated that it sometimes swelled. In my absence, my colleague, Mr. Grant Andrew, performed nephropexy.

Coming now to the subject of operative treatment—for I say nothing about abdominal belts and supports which may quite efficiently answer the purpose in a few of the less pronounced cases—I was led to adopt the method I am about to describe through an operation that I performed on a case where the kidney had been previously fixed, but which had toppled over in such a way as to cause temporary attacks of hydronephrosis from kinking of the ureter. This kidney had been secured to the lumbar region in the usual way; but apparently only a part of its convex surface, and that the lower, had been stitched; the upper pole must have been free, for this had, in time, gradually bent over, and caused the trouble for which the patient sought treatment. I found the viscus extremely firmly held by adhesions between the parietes and the lower part of the organ. Indeed, so broad and firm was the attachment that I found it impossible to free it sufficiently to allow of the requisite replacement and fixation. I had, therefore, no other alternative than that of excising the organ. The previous operation had been performed by a well-known surgeon; and so far as its execution was concerned, there was no question as to the success of the stitching, in the firmness of the fixation of that part of the kidney embraced by the sutures.

The partial recurrence of the nephroptosis, however, led me to the following two conclusions: first, that by suture and proper after-treatment, it was possible to make certain of complete and permanent fixation of a movable kidney; and second, that no fixation which simply secured a part, and not the whole of the convex surface of the viscus, could be considered as adequate to the requirements of the condition.

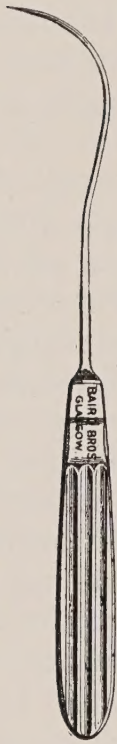
In thinking further over the matter, it seemed that to secure the kidney, however firmly, only to the incision

made in the loin, was not fulfilling all that was needed, for it placed the organ in a lower position than natural, and might possibly fail in completely rectifying any obstructive influences already exercised upon the structures entering and leaving the hilus. What, therefore, appeared requisite for the proper replacement of the viscus to its normal anatomical position high up in the lumbar region and partly under the ribs, was to devise some means of pulling it up, and when so elevated, of fixing it securely.

To carry out this plan no other way seemed possible except by trespassing on the pleural cavity, and passing sutures through the lower part of that space. To this there appeared no objection, inasmuch as the invasion of the cavity by a needle and suture, at a part unoccupied by the lung, could not conceivably be fraught with any immediate or remote danger.

I accordingly put the method to the test at the first opportunity that presented, and was so satisfied with the result, that I did not hesitate to continue in its practice. I have treated about fifteen cases with unbroken success, so that I am led to suggest the method with every confidence that it will be found simple and safe in execution and permanent in its results.

FIG. 35. Special needle for introduction of "sling" suture in the "sling" operation of nephropexy. One-third natural size.)



Briefly, the operation consists in exposing the kidney; freeing it of its fatty capsule; delivering it, if possible, externally; dividing longitudinally and partially detaching the true capsule; introducing sutures, the "sling" one being passed above the upper border of the eleventh rib; replacing the kidney; tying sutures; and partially closing, packing, and draining the parietal wound.

The only special instrument required is a curved needle in handle, of the shape shown in the figure. It differs from other needles of a similar kind in being made longer in the part between the handle and the commencement of the curve (*see* Fig. 35).

In detail, the operation is thus performed :

The patient is placed on the operating table and turned on to the non-affected side. A small sand-pillow is placed

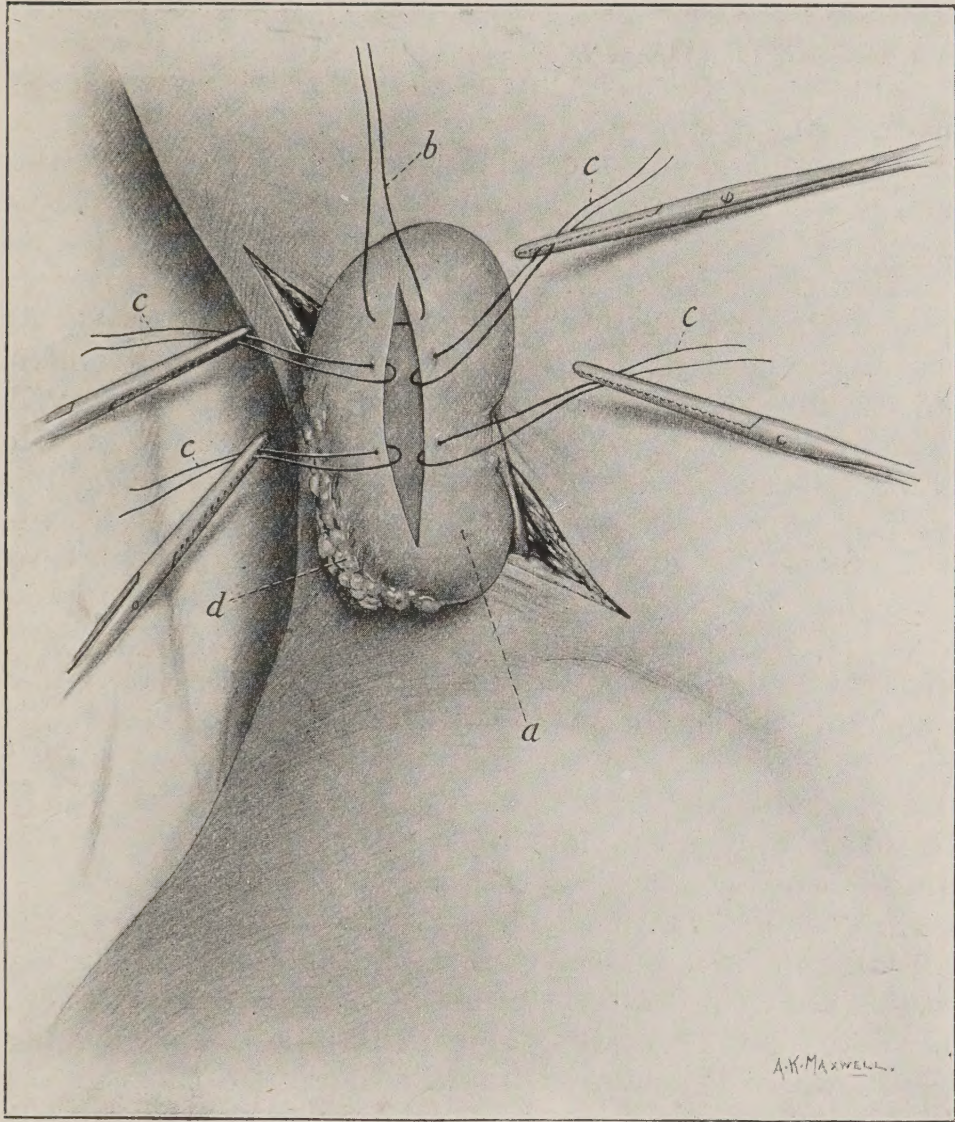


FIG. 36. The operation of nephropexy by the " sling " method. *a*, Kidney deprived of most of its fatty capsule, *d* ; *b*, sling suture for passage above the eleventh rib ; *c*, *c*, *c*, *c*, the four lateral sling sutures for passing through the parietes.

under the loin in order to open out the costo-iliac space of the affected side.

The kidney is exposed by the usual oblique incision carried downwards and forwards more or less parallel to the costal margin.

The viscus is forced up into the wound by the assistant exercising pressure upon it from the abdomen.

The operator removes as much as possible of the fatty capsule, and then endeavours, if he can, to deliver the viscus on to the body surface. This is not always possible, and when impossible, the next stage of the operation must be conducted with the organ *in situ*, and not as shown in the illustration (*see* Fig. 36).

The capsule is now incised along the greater part of the dorsal convex surface, and the five silk-worm gut sutures are passed and temporarily secured with pressure forceps, as shown in the illustration.

If the kidney has been withdrawn for the purpose of passing the sutures, it is now returned into the abdomen, and the upper "sling" suture threaded to a large curved needle, by means of which it is made to traverse the tenth intercostal space, and appear through the skin. This needle may either be passed from below upwards, as shown in the figure (*see* Fig. 37), or it may be introduced, before being threaded, from above downwards, and from without inwards. In the latter case, the forefinger of one hand acts as a guide to the point as it enters the abdomen after transfixing the diaphragm. When it appears at the wound, the eye is threaded with the two ends of the "sling" suture, so that the withdrawal of the needle carries with it the suture, and effects the same result as if employed by the other method.

The "sling" suture is now drawn taut and tied over a small roll of iodoform gauze (*see* Fig. 38). The other sutures are then dealt with, and in the following manner: the outer end of each is threaded to a curved cutting needle, which is made to transfix the entire thickness of the parietes on each side. This transfixion should be made at a higher level than the respective points of perforation of the capsule, so that when tied they also assist in elevating the kidney, and relieving, somewhat, the tension of the "sling" suture.

These external sutures, from the way in which they secure the capsule, necessarily entail, on being tied, a fairly free exposure of the renal cortical substance, and a gaping of the whole wound. The greater part of this wound is gently stuffed with iodoform gauze, so that the

healing which results must be by granulation and the consequent ultimate formation of a considerable amount

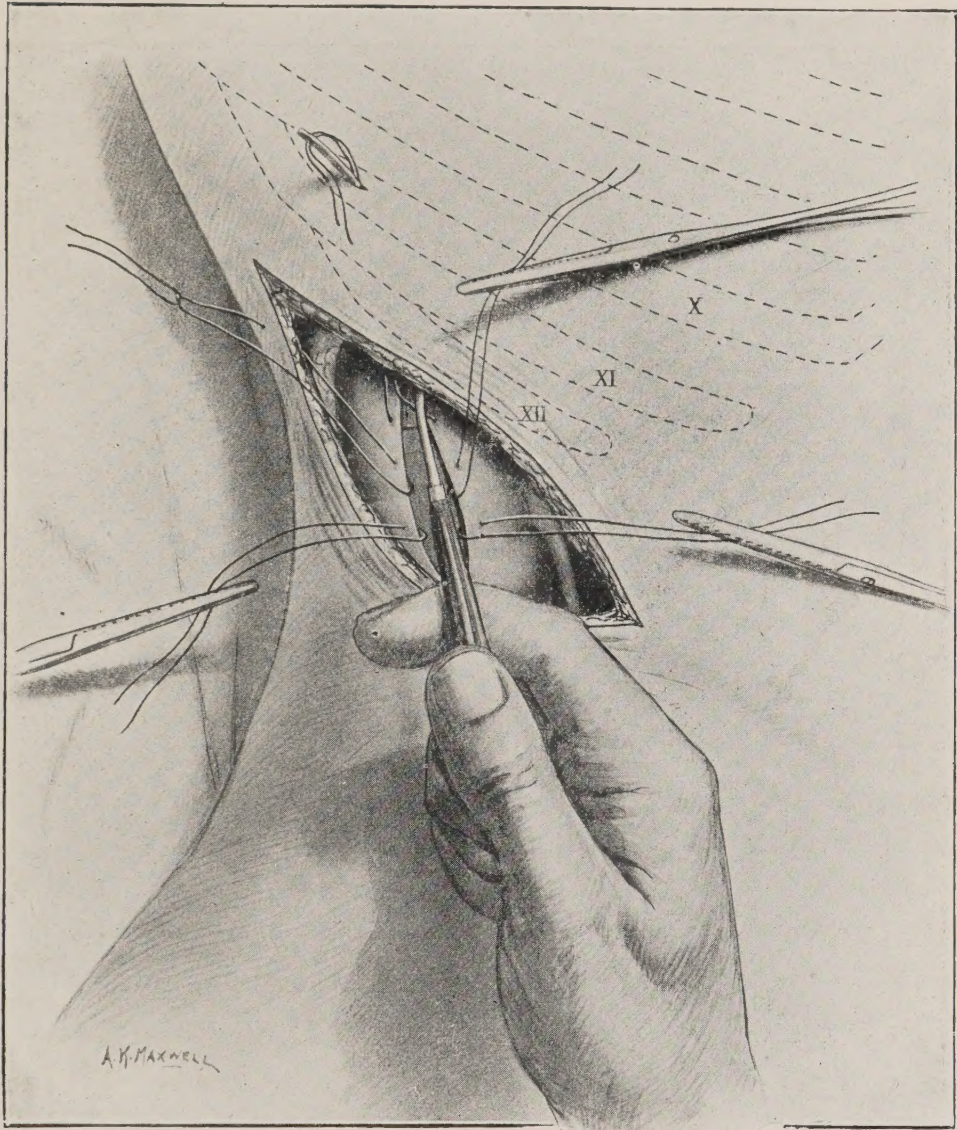


FIG. 37. The operation of nephropexy by the "sling" method. Shows method of passing the upper sling suture with the needle. One of the lateral sling sutures is partially tied to show how it is passed obliquely upwards through the parietes.

of firm, cicatricial tissue. The removal of the fatty capsule often leaves a large space, almost a cavity, at the lower part of the kidney. For a few days, therefore, it is better to keep in a small rubber tube for drainage.

Fifteen minutes may be taken as a reasonable time for the performance of the operation.

The after-treatment consists in maintaining the patient,

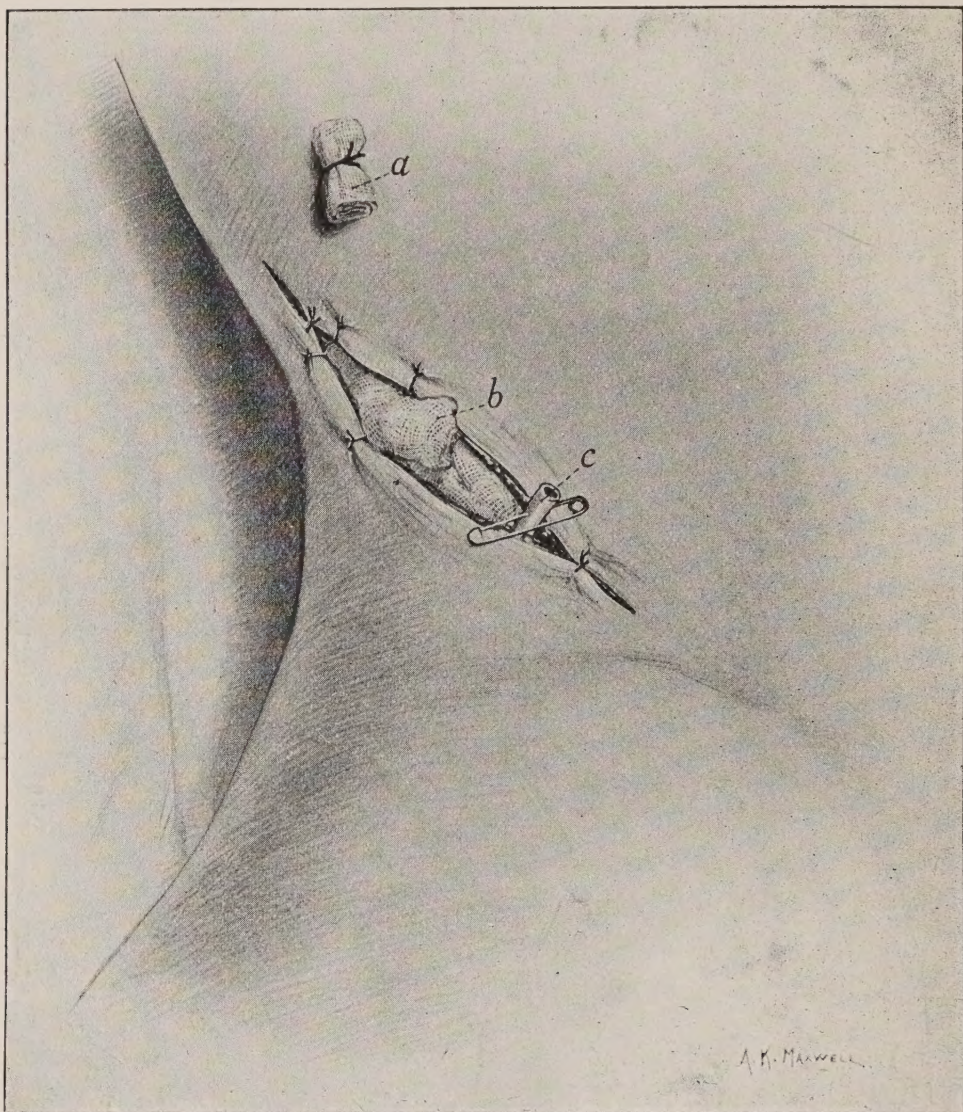


FIG. 38. The operation of nephropexy by the "sling" method. Operation completed. *a* is the small pad of iodoform gauze over which the ends of the upper sling suture are tied; *b*, the iodoform gauze packing which extends deeply to the kidney substance; *c*, drainage tube inserted into the subrenal pocket.

as much as possible, in the dorsal position, with permission, however, to lie on the affected, if able to do so, but not on the non-affected side. The packing may be eased out by degrees, commencing on the third day, and completely

removing it on the sixth or seventh. The drainage tube will have fulfilled its purpose by about the fifth day. The patient should not be allowed up for four weeks, in order that the adhesions may have become sufficiently firm and non-giving to maintain the kidney permanently in its bed.

CHAPTER XXIII

A REVISED NOMENCLATURE FOR OPERATIONS UPON THE ABDOMINAL VISCERA

IN 1896, at the commencement of the chapter on "The Operations upon the Intestines" in my book on "The Surgery of the Alimentary Canal" (Chapter LXIV, p. 518), I strove to point out how great was the need for some reform in the nomenclature of the operations upon these particular parts of the body; and I further ventured to suggest certain alterations and limitations in the usage of terms which, if promulgated by writers and teachers, would greatly simplify the present cumbersomeness of the modern terminology.

Again, in the following year, 1897, I wrote an article in the *Annals of Surgery*, vol. xxvi, p. 289, entitled "A Plea for a Revised Nomenclature of Operations upon the Alimentary Canal." Whether I may venture to attribute to that article any of the improvements in terminology that have taken place within recent years, more particularly among American surgeons, is more, perhaps, than I have any right to take credit for. Certainly, however, it is, that, in the United States, greater accuracy in the use of suitable terms has become markedly manifest.

In venturing for the third time to write upon this subject, I am tempted to extend the sphere of its application to all abdominal organs, and not, as hitherto, to limit it to the alimentary canal. By so doing, I hope to embrace in one scheme of unification that which will tend to simplify to the utmost the nomenclature of all operations upon abdominal and other closely associated viscera.

Before, however, propounding the scheme, let me repeat to some extent, that to which I gave expression in my

article in the *Annals of Surgery*, some of the reasons which render it advantageous, if not actually imperative, that the subject should be carefully and judiciously considered.

In no branch of surgery, more than in that which concerns itself with the operative treatment of affections of the abdominal viscera, has there arisen such an exceptional combination of circumstances that was bound sooner or later to lead to confusion and misunderstanding in the terms made use of. The circumstances which have led to these difficulties are easy to explain.

We have, in the first place, certain organs, as the œsophagus, the stomach and intestines, the rectum, the urinary system, and the female reproductive organs, which have at all times received more or less separate attention from surgeons, who, with somewhat exclusive considerations, have employed certain terms which to them individually appeared appropriate for the end in view, but were used without due regard to the possibility of similar terms being in vogue for other organs, with, however, differences of significance.

Another reason, and a very natural one, arises from the extraordinary development, which has taken place within the last five and twenty years, of the surgery of this region. It was thus bound to happen that a term would be applied to a particular operation apparently quite suitable at the time, but proving inadequate and inappropriate when operations became more numerous, and differences often slight, but still important, distinguished the old from the new.

Still another reason for this confusion, which it is impossible to ignore, and that is, the almost classical associations which have grown up around a particular operation and the name originally applied to it. A difficulty of no small moment is further added in this respect, that most of the older terms were in use, or came to be used, in the earlier years by many of our now most experienced and distinguished surgeons. A natural conservancy would, therefore, exist in the mind of these surgeons against changing a now almost classical term for a more suitable one, however much the newer operation might indicate the advisability of doing so. Time-honoured reasons are cogent ones against making changes, and merit alike respect and all due consideration. In equal estimation and regard should

be held the reluctance of those with whom custom has bred familiarity.

But what, it may be justly asked, of the future generation of rising surgeons upon whom custom has but little hold, especially when viewed in relation to the innumerable and steadily increasing difficulties with which they see themselves confronted? What also of the poor hard-worked student of the day, whose mind is already taxed to the utmost, and who finds when he enters upon the domain of abdominal surgery a series of terms as bewildering in number as they are confusing in meaning? Fresh from his school or college, he looks at the etymology of the long words he meets with, hoping that his Latin and Greek may give him some helpful clue to their real significance. His good hopes, however, are soon dispersed, for he finds terms etymologically alike yet signifying different operations, and operations quite similar in their execution designated by different names.

Without a complete and exhaustive revision—which would for practical purposes be too radical—it is not possible to devise a set of terms that would be etymologically correct. The object I aim at is to be sure that a certain operation performed upon one organ under a particular name, that name should, with merely the regional distinction, convey to the student a clear conception of a like operation performed on another organ.

To make clearer what I have just stated, I will illustrate, by reference to certain operations, both the confusion associated with the present system of nomenclature, and the advantages which would be attached to some alteration in it.

Take, first, the term *œsophagotomy*. Etymologically the word signifies a cut into the *œsophagus*. The student in this instance easily grasps the general nature of the operation. He learns, therefore, that the operation consists in opening the canal, it may be, for the removal of foreign bodies, for the passage of bougies, or for simple exploratory purposes, &c. He has at the same time acquired an approximate knowledge of the operations of *gastrotomy* and *duodenotomy*. As, however, the canal is descended he meets with such a term as *enterotomy*, when confusion commences; and by the time he arrives at *colotomy* he becomes worse than confounded, for he encounters

a term which has several synonyms, none of which help, but all tend to puzzle. How great, finally, is his plight, when for the first time he learns that ovariectomy means not a cut into the ovary, but the cutting away of an ovarian tumour !

In order to fully appreciate the position I am striving to take up, I must beg again of the reader to bear in mind that I am assuming the position of a student, and that to rightly understand the situation he must do the same ; freeing himself for the time being of that knowledge which places his own conception of things in a clearer light than it is possible for the uninitiated to have.

If, now, the student has been correctly taught what he is to understand by an artificial anus, a fæcal fistula, and a colostomy, he will give the following definitions. He will say that an artificial anus is an opening made into the bowel with the object of diverting *all* the contents of the same through the newly made orifice ; while a fæcal fistula, when produced by operation, is the diversion of only a *portion* of the bowel contents through the opening. A colostomy, he will state, is the name of an operation performed for the relief of obstructed intestine, and may fulfil the functions of an artificial anus or a fæcal fistula, according to the completeness of the obstruction below the seat of the artificial opening. The term colostomy may puzzle in regard to its etymological significance when compared with the correct application of the affix in the operation of œsophagostomy and gastrostomy. The affix “stomy,” literally translated, is a mouth (στομα), and naturally suggests the function connected with that aperture. Its usage, therefore, for an opening to admit of the *exit* and not of the *entrance* of material, is somewhat a misnomer. So far, however, as the nature of the operation is concerned, its more recent applications have still maintained a similitude to the original, so that whatever organ is associated with the affix, whether it be the œsophagus, the stomach, the intestines, or the gall-bladder, it is sufficiently well understood what kind of operation is meant.

Let me now take another word. The term enterorrhaphy etymologically signifies suture of the intestine, the affix “rrhaphy” being interpreted, a suture (ράφή), but in usage it has been specialised to mean suture of the *cut edges* of

the bowel. The student now comes across the more recently introduced term of gastrorrhaphy, and he is quite wrong if he assigns to it a meaning similar to that he has learned in connection with the intestine, for here the term has assumed its correct meaning, and signifies an operation where the suturing together of a fold in a dilated stomach is the essential feature. With the knowledge of these two different operations, he now comes across the operation of proctorrhaphy, and is fairly puzzled to know whether it is an operation which resembles enterorrhaphy or one like gastrorrhaphy. The term is generally understood in the same sense as used for the intestine, that is, it implies the union of the *cut edges* of the rectum. But Lang has performed an operation for prolapse of the rectum which consists in narrowing the dilated canal by inserting two rows of buried sutures, thus doubling in a longitudinal fold. The operation is, therefore, precisely analogous to that upon the stomach, and is correctly designated by the affix. But, probably, the student's perplexity reaches its apotheosis when he encounters the term nephorrhaphy; for no amount of reasoning from what knowledge he has already derived from the previous employment of the affix will enable him to know that, in the case of the kidney, the operation called by this term implies fixing it to the abdominal parietes.

I might multiply instances of the confusion, through carelessness often, which exists in the employment of other terms; but I feel I have said enough to show that there is some reason for striving to lessen the difficulties necessarily associated with the ever-increasing technical vocabulary of the already overburdened student; and for endeavouring to place on a sounder and more rational basis the nomenclature of operations upon a region which has come to play such an all-important part in the field of surgery.

I shall endeavour to frame a scheme which I venture to hope will systematise these various operations, but which, I feel, cannot overcome all the difficulties of the case. If, however, it only forms a basis for further improvement, my object will not have been attempted in vain.

It can be easily understood that the determining feature of a name lies chiefly in the affix, and that if a true similarity is to exist between the potentiality of one name and

that of another, the meaning of the affix must be constantly adhered to in all its applications. Further, it may be stated, that there is no limit to the terms which might be coined when a particular region is meant to be associated with the operation ; for, all that it is necessary to do is to prefix the name of the region to the required affix, and at once the correct name is obtained.

It has, of course, to be remembered that there are a number of operations which will not lend themselves to any such simple scheme as that just enunciated ; and although they cannot be classified by any special affix, nevertheless it is possible in some cases to systematise them, and in that way simplify their nomenclature. These remarks apply more particularly to certain operations upon the intestine—the formation of an artificial anus, and the re-establishing of the continuity of the canal after excision, or exclusion, of certain portions of it. As these operations cannot very well be entered upon the tabulated scheme, they are introduced here.

Artificial Anus :

1. Enteric.
2. Cæcal.
3. Ascending Colonic.
4. Transverse Colonic.
5. Descending Colonic.
6. Iliac Colonic.
7. Pelvic Colonic.

Intestinal Anastomosis :

1. End to end.
2. Lateral approximation (side to side).
3. Lateral implantation (end to side), also invagination (A.E.M.).

By suture :

1. Lembert (cont. or inter.).
2. Connell.
3. Halsted.
4. Maunsell, &c.

By mechanical appliances :

1. Murphy's Button.
2. Robson's Bone Bobbin.
3. Various plates, &c.

There are many other operations possessing peculiarities, and limited to certain organs. These are sometimes known by the name of the surgeon originating the operation, as, for instance, Edebohl's operation for chronic Bright's disease, or the "Talma" or "Morison-Drummond" operation for hepatic cirrhosis. It is a practice not to be encouraged, because it tends to multiply terms without conveying any assistance regarding their meaning. When a new operation is devised, it should have as a prefix *the organ* upon which the operation is performed, and as an affix that which describes, as much as possible, *the nature* of the operation. Names, however, are quite suitable when they serve to indicate modifications of established operations. Thus, Finney's modification of gastro-duodenostomy, or Kocher's method of performing gastro-enterostomy, are quite correct.

Apart from the operations named in association with the affix "stomy" as shown on the "Scheme," there are a great number in which *fistula bimucosæ* are formed, either between parts of the same viscus, or between one viscus and another. It is usual in the latter case to place, where possible, the proximal viscus first. The various operations referred to may be tabulated under the headings of the different viscera involved in the anastomosis:

Œsophagus	{ Œsophago-duodenostomy	
	{ Œsophago-jejunostomy	
Stomach	Gastro-gastrostomy	
Stomach and Intestine	{ Gastro-duodenostomy	{ Gastro-jejunostomy
	{ Gastro-enterostomy	{ Gastro-ileostomy
	{ (Anterior, Posterior)	{ Gastro-colostomy
Intestine	{ Entero-enterostomy	{ Jejun-jejunostomy
		{ Jejun-ileostomy
		{ Jejun-colostomy
		{ Ileo-ileostomy
	{ Colo-colostomy	{ Ileo-colostomy
Liver	Hepato-enterostomy (Hepato-cholangio-enterostomy)	{ Hepato-duodenostomy
		{ Hepato-jejunostomy
		{ Hepato-ileostomy
		{ Hepato-colostomy
Gall-bladder	{ Cholecyst-gastrostomy	
	{ Cholecyst-enterostomy	{ Cholecyst-duodenostomy
		{ Cholecyst-jejunostomy
		{ Cholecyst-ileostomy
		{ Cholecyst-colostomy

Gall-ducts	{ Choledocho-entero- stomy	{ Choledocho-duodeno- stomy Chole ocho-jejuno- stomy Choledocho-ileostomy Choledocho-colostomy
Kidney	Pyelo-ureterostomy	
Ureter	{ Uretero-ureterostomy Uretero-colostomy Uretero-colpostomy	
Bladder	{ Uretero-urinocystostomy Urinocysto-colostomy	

Wherever an anastomosis is effected with the pelvic colon, as for instance in the case of uretero-colostomy, it is signified by the word colostomy. Thus the term proctostomy, which under the old style of nomenclature would have been employed, is entirely omitted.

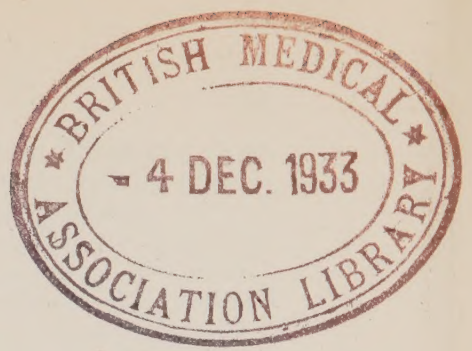
A SCHEME OF NOMENCLATURE FOR OPERATIONS UPON THE ABDOMINAL VISCERA

AFFIX AND NATURE OF OPERATION	ABDOMEN	ÆSOPHAGUS	STOMACH	DUODENUM	SMALL INTESTINE		LARGE INTESTINE			RECTUM	LIVER	GALL-BLADDER	GALL-DUCTS	SPLEEN PANCREAS	KIDNEY	URETER	BLADDER	PROSTATE	OVARY	FALLOPIAN TUBES	UTERUS	OMENTUM	
					Jejunum	Ileum	Colon	Cæcum	Appendix														
-tomy (τέμνω, to cut). Simple incision into or opening of some viscus.	Laparotomy Celiotomy Herniotomy	Æsophagotomy	Gastrotomy	Duodenotomy	Enterotomy	Jejunotomy	Ileotomy	Colotomy †	Cæcotomy or Typhlotomy		Proctotomy †	Hepatotomy	Cholecystotomy	Choledochotomy (common duct) (Supra-duodenal, retro-duodenal, duo-deno-) Cholecysticotomy (cystic duct) Cholangiotomy (intra-hepatic ducts)	Pancreatotomy Splenotomy	Nephrotomy Pyelotomy (Abdominal, lumbar)	Ureterotomy	Urino-cystotomy (suprapubic, perineal, rectal, vaginal)	Prostatotomy		Salpingotomy	Hysterotomy Colpotomy or Elytrotomy (suprapubic)	
-stomy * (στόμα, a mouth). The formation of an opening into a viscus which remains temporarily or permanently patent.	Laparostomy Celiostomy	Æsophagostomy	Gastrostomy	Duodenostomy	Enterostomy	Jejunostomy	Ileostomy	Colostomy †	Cæcostomy	Appendicostomy	Proctostomy †	Hepatosotomy	Cholecystostomy	Choledochostomy (common duct) Cholecysticostomy (cystic duct) Hepaticostomy (hepatic duct)	Pancreostomy (cyst)	Nephrostomy	Ureterostomy	Urino-cystostomy		Oöphorostomy (ovarian cyst)	Salpingostomy		
-ectomy (ἐκτεμνω, to cut out). The removal of a part partially or completely.	Lipectomy Herniocysec- tomy (ventrical, umbilical, post- operative)	Æsophagectomy (partial)	Gastreectomy (partial, com- plete) Pylorectomy	Duodenectomy (partial)	Enterectomy	Jejunectomy	Ileectomy	Colectomy †	Cæcectomy	Appendicectomy	Proctectomy †	Hepatectomy (partial)	Cholecystectomy		Splenectomy Pancreectomy (partial)	Nephrectomy (partial, com- plete) (Abdominal, lumbar)	Ureterectomy	Urino-cystectomy (partial, complete)	Prostatectomy (partial, com- plete) (Suprapubic, perineal)	Oöphorectomy	Salpingectomy	Hysterectomy (partial, complete) (Abdominal, vaginal)	Epiploectomy (partial)
-rrhaphy (ράφή, a suture). Lessening the size of a viscus by suturing together parts of its parietes.			Gastrorrhaphy or Gastroplication					Colorrhaphy †	Cæcorrhaphy		Proctorrhaphy †												
-plasty (πλάσσω, to form). The widening by cutting of strictured canals.		Æsophagoplasty	Gastroplasty Pyloroplasty		Enteroplasty	Jejunoplasty	Ileoplasty	Coloplasty †			Proctoplasty †					Ureteroplasty							
-pexy (πηγνυμι, πῆξω, to fix). The fixing of an organ usually to some part of the abdominal parietes.			Gastropexy					Colopexy †	Cæcopexy			Hepatopexy				Nephropexy		Urino-cystopexy		Oöphoropexy	Salpingopexy	Hysteropexy Colloperxy (cervix)	Epiploexy Omentopexy
-lysis (λυω, to release). The freeing of a part, usually by the separation of adhesions.			Gastrollysis					Cololysis					Cholecystolysis							Oöphorolysis	Salpingolysis	Hysterolysis	
-diosis (έίωσις, to push asunder). The forcible dilatation of a constricted canal.		Æsophagodiois	Pylorodiosis								Proctodiosis †											Hysterodiosis (cervix)	

* See preceding pages for other operations in which this affix is employed.

† In order to distinguish the particular section of the colon operated upon, the words Ascending, Transverse, Descending, Iliac, and Pelvic should precede the technical terms.

‡ Within recent years the Rectum has been accepted as only that portion of the bowel which extends upwards four inches from the anus; that is to say, it does not strictly form an abdominal part of the alimentary canal. The four inches above this segment was originally included in the Rectum, and was, therefore, in relation to the peritoneum. But this upper segment is now called the Pelvic Colon. Hence, with the exception of the operations of Proctectomy and Proctodiosis, the other operations, to be correct, ought to be expressed in terms connected with the Pelvic Colon. As the prefix "procto" means anus (πρωκτός), the prefix "recto," which means straight (rectum), would be the more correct term to use.



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